Proceedings of the American Academy of Arts and Sciences.

VOL. XXXIV. No. 23. — JUNE, 1899.

PROCEEDINGS OF THE ACADEMY, 1898–1899.

A TABLE OF ATOMIC WEIGHTS. BY THEODORE WILLIAM RICHARDS.

REPORT OF THE COUNCIL: BIOGRAPHICAL NOTICES.

JUSTIN WINSOR. BY A. LAWRENCE LOWELL.

SAMUEL ELIOT. BY BARRETT WENDELL.

JULES MARCOU. BY ALPHEUS HYATT.

THEODORE LYMAN. BY HENRY P. BOWDITCH.

LIST OF THE FELLOWS AND FOREIGN HONORARY MEMBERS.

STATUTES AND STANDING VOTES.

INDEX.

(TITLE PAGE AND TABLE OF CONTENTS.)

PROCEEDINGS.

Nine hundredth Meeting.

MAY 11, 1898. — ANNUAL MEETING.

Vice-President LOWELL in the chair.

In the absence of the Secretaries, John Trowbridge acted as Corresponding Secretary and Edwin H. Hall as Recording Secretary.

The Report of the Council was read.*

The Treasurer presented his annual report, of which the following is an abstract: —

GENERAL FUND.

Receipts.

Balance, May 1, 1897			$1,961.73
Assessments	$1,005.00		
Sale of publications	238.86	$1,241.86	
Income from investments		4,663.82	
Return of bank tax		40.00	
Legacy of Hon. John Lowell		3,000.00	
Donations		105.00	9,050.68
			$11,012.41

Expenditures.

General expenses		$2,026.00	
Publishing expenses		1,365.31	
Library expenses		1,139.15	$4,530.46
Investments			3,000.00
Balance, April 30, 1898			3,481.95
			$11,012.41

* See Proceedings, Vol. XXXIII. p. 517.

RUMFORD FUND.

Receipts.

Balance, May 1, 1897		$3,133.66
Income	$2,366.25	
Return of bank tax	94.04	2,460.29
		$5,593.95

Expenditures.

Books and binding	$94.10	
Publishing	59.91	
Investigations	1,651.50	
Rent	10.00	$1,815.51
Investment		2,000.00
Balance, April 30, 1898		1,774.84
		$5,593.95

WARREN FUND.

Receipts.

Balance, May 1, 1897	$870.95
Income	855.00
	$1,725.95

Expenditures.

Investigations	$800.00
Balance, April 30, 1898	925.95
	$1,725.95

BUILDING FUND.

Receipts.

Balance, May 1, 1897	$773.78
Income	494.36
	$1,268.14
Balance, April 30, 1898	$1,268.14

The Librarian presented his annual report, of which the following is an abstract: —

2,751 books and pamphlets have been added to the library during the past year, of which 2,089 were obtained by gift and exchange, 513 purchased with the appropriation from the

income of the General Fund, at a cost of $336.25, and 149 with the appropriation from the income of the Rumford Fund, at a cost of $23.92. 224 volumes were bound at an expense of $331.95, of which $32.75 was charged to the Rumford Fund. 185 volumes were borrowed from the Library by 33 persons, of whom 24 were Fellows of the Academy.

The following reports were also presented: —

Report of the Rumford Committee.

At the last Annual Meeting of the Academy the sum of $1,000 was placed at the disposal of the Rumford Committee for use in aid of investigations to which the Rumford Fund may properly be applied.

During the past year appropriations from this have been made as follows: —

(1) To Professor George E. Hale, Director of the Yerkes Observatory, $400, to meet in part the expense of the construction of a large spectro-heliograph.

(2) To Professor A. G. Webster, of Clark University, $250, for the construction of an electrically governed revolving mirror.

(3) To the same, $100, for an investigation upon the Zeeman effect.

(4) To Professor A. A. Michelson, of the University of Chicago, $250, to meet the cost of constructing a new form of interference spectrometer. To this appropriation an additional amount of $250, from the Rumford Fund, was added by vote of the Academy at its March meeting, on recommendation of the Committee.

(5) In addition to these, at the request of the Committee, the Academy at its January meeting voted to grant the sum of $400, from the Rumford Fund, to Professor W. C. Sabine, of Harvard University, for a research on ultra-violet radiations.

In response to a request sent to these and other recent grantees, asking for information as to the progress of the researches to which aid had been rendered, replies have been received as follows: —

Professor Hale writes: "I have at last succeeded in obtaining two Voigtländer portrait lenses of 6¼ in. aperture, which are to serve as the principal optical parts of the spectro-heliograph. These lenses, which now cost $600 each, were purchased for $185 each. The balance of the $400 appropriation is to be used in paying an instrument maker who will be employed in constructing the spectro-heliograph.

I have engaged for this purpose the most skilful instrument maker we ever had at the Observatory, and feel certain that he will build a most satisfactory instrument. The large 60° prisms (4 in. on an edge and 6½ in. high) have already been obtained, and as I am now engaged in making the drawings of the spectro-heliograph, we may reasonably hope that it will be ready before many months have elapsed."

Professor Hale adds, "I feel very grateful to the Rumford Committee for rendering possible the construction of an instrument which should certainly give valuable results when employed with the 40-inch telescope."

Professor Webster writes as follows regarding (2). The "appropriation of $250 for a revolving mirror has not been drawn upon. I have made various experiments to determine the power required, and the friction of bearings of various sorts, and expect to have the instrument constructed during the summer vacation."

Regarding (3) he writes: "The intention was to apply Michelson's method of the interferometer, using however an instrument to measure the visibility, instead of depending, as has hitherto been done, upon eye estimates. On considering the relative advantages of the bolometer, the radiomicrometer, and the radiometer, the last named instrument appeared to be the most convenient, and was therefore chosen. Most of the time has been spent in constructing and experimenting with the radiometer, with the result that, if the instrument was made sensitive enough to measure the quantities involved, its zero was constantly changing, and the instrument was altogether too slow for the purpose. The glass plates of the interferometer also absorbed such a large fraction of the radiation that the method would have been impracticable, without fluorite plates, which would have entailed a large expense. We have therefore reluctantly been obliged to give up work on the Zeeman effect, and the money will be returned."

Professor Michelson writes that his paper read at the April meeting of the Academy may be considered as a report of progress of his investigation, the "echelon spectroscope" there shown being the first made instrument of its kind. The amount of the appropriation still unexpended, about $300, will be applied to the construction of a larger instrument of the same character.

Professor Sabine states that the camera made for his investigation by Clark and Sons has barely been completed within the past few days, under which circumstances it has not yet been possible to begin experimental work.

Statements have also been received from persons to whom recent appropriations have been granted, but prior to May, 1897, as follows: —

Professor B. O. Peirce, of Harvard University, was granted an appropriation of $200 in 1892, and a further appropriation of $250 in 1895, for researches upon the thermal conductivity of rocks and other poor conductors. A preliminary paper has been published in the American Journal of Science, with the consent of the Rumford Committee, and also a table of roots of a Bessel Equation, in the Bulletin of the American Mathematical Society. The cost of the investigation, which has proved to be a very laborious one, has greatly exceeded the amount of the grant. It is expected to publish the final results in the near future.*

Professor F. A. Laws, of the Massachusetts Institute of Technology, was granted $300 in 1894, to aid in an investigation of the thermal conductivity of metals by a new method proposed by him. The research was delayed for a time, but is now in active progress, and it is probable that numerical results will be secured very soon. The unexpended balance of the appropriation will be applied to the determination of the conductivities of other metals.

Professor E. L. Nichols, of the Cornell University, received in 1894 a grant of "a sum not exceeding $500" (on the authorization of the chairman) in aid of a study of the emissive power of carbon at different temperatures. Professor Nichols reports that absence from the country for a year, and various unforeseen difficulties have delayed progress, although much time has been spent on preliminary work. The expenses of the research are only in part met by the appropriation from the Rumford Fund, of which about $200 has been expended.

Professor Edwin H. Hall, of Harvard University, received a grant of $250 in 1895, in aid of an investigation on the thermal conductivity of metals. The research thus aided was embodied in part in a paper presented to the Academy on January 8, 1896, on the "Thermal Conductivity of Mild Steel." A second paper relating to the thermal conductivity of cast iron is likely to be ready for publication during the coming summer.† There is at present an unexpended balance of $120.

Professor A. G. Webster received a grant of $250 in 1895, for a research on the velocity of electrical waves. Regarding this research Professor Webster says: "A part of the money has been expended partially to defray the expense of the construction of a machine for measuring the interval between the rupture of two electrical contacts, which is

* See Proceedings, Vol. XXXIV. No. 1. † Ibid., No. 11.

the main apparatus used. I have undertaken to attain an accuracy up to one ten-millionth of a second, and the experiments already made encourage me to believe that I shall succeed. On account of the mechanical difficulties involved by the high speeds used, the apparatus has had to be changed a great many times, and the work has been very intermittent. The apparatus is therefore not yet completed, but I hope it will be by summer, when I shall be able to complete the experiments. The sum of about $100 remains unexpended, but will be required before the experiments are completed."

Professor Henry Crew, of the Northwestern University, was granted $400 in 1896, to aid a research upon the arc-spectra of metals. A paper embodying in part the results of this research, entitled "Sources of Luminosity in the Electric Arc," was recently presented to the Academy, and is now in press.* An unexpended balance of $29.84 will be employed in the prosecution of further research in the same general direction.

Mr. R. O. King, then of Harvard University, received a grant of $100 in 1896, for aid in a research upon the "Thomson Effect in Metals." A paper embodying the results of the research thus aided, and entitled "The Thomson Effect in Copper," was presented to the Academy by Professor E. H. Hall at its meeting in April, 1898. A balance of about $10 remains unexpended.

It was voted by the Committee, at a meeting held March 9, 1898, that the Academy at its Annual Meeting be asked to appropriate the sum of $1,000, as in previous years, to be expended under the direction of the Committee in furthering investigations in Light and Heat.

The Committee has also considered at length the question of an award of the Rumford Medal. The claims of various investigators and inventors have been considered with great care, and more than one among them appeared to be deserving of such recognition. After prolonged consideration, the Rumford Commitee has voted at two separate sessions, in accordance with long established custom, to recommend to the Academy an award of the medal to Professor James E. Keeler, now Director of the Lick Observatory, for his application of the spectroscope to astronomical problems, and especially for his investigations of the proper motions of the nebulæ, and the physical constitution of the rings of the planet Saturn, by the use of that instrument.

CHARLES R. CROSS, *Chairman.*

May 11, 1898.

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* See Proceedings, Vol. XXXIII. No. 18.

Report of the C. M. Warren Committee.

In behalf of the C. M. Warren Committee, I have to report that at the last Annual Meeting of the Academy the sum of $600 from the income of the Warren Fund was granted to Professor C. F. Mabery, of Cleveland, in furtherance of his researches on the composition of petroleums. A letter from Professor Mabery, dated March 23, 1898, gives a clear idea of the present condition of his work.

With regard to other grants from the Warren Fund, now outstanding, viz., those to Professor Phillips of Allegheny City for the investigation of natural gas, and to Professor Hofman of Boston for work on the fusibility of slags, there are good reasons for believing that satisfactory progress is being made by both these chemists.

F. H. Storer, *Chairman.*

May 11, 1898.

Report of the Committee of Publication.

The publications of the past year consist of four numbers of Vol. XXXII., and the first seventeen numbers of Vol. XXXIII., of the Proceedings, aggregating 464 pages and 9 plates.

Only one of these numbers was printed at the charge of the Rumford Fund. The others have cost $1,365.31. The appropriation for publications made by the Academy from its General Fund in May last was $2,100, leaving an unexpended balance of $734.69, to which must be added $236.86 from the sales of the year, or a total balance of $971.55.

The Committee hopes that at least the greater part of this may be added to the ordinary annual appropriation of $1,800, as some unusual expenditures are looked for.

Samuel H. Scudder, *Chairman.*

May 11, 1898.

On the recommendation of the Committee of Finance it was

Voted, To make the following appropriations from the income of the General Fund for the ensuing year: —

For general expenses	$1,500.00
For the Library	1,600.00
For publishing	2,500.00

Voted, That the assessment for the ensuing year be five dollars.

On the recommendation of the Rumford Committee it was

Voted, That one thousand dollars ($1,000) from the income of the Rumford Fund be placed at the disposal of the Rumford Committee to be expended in aid of investigations on Light and Heat, payments to be made on the order of the Chairman of the Committee.

Voted, To award the Rumford Premium to James Edward Keeler, for his application of the spectroscope to astronomical problems.

On the recommendation of the C. M. Warren Committee it was

Voted, That the sum of six hundred dollars ($600.00) from the income of the Warren Fund be granted to Professor Charles F. Mabery, of Cleveland, Ohio, for the continuation of his researches on petroleums.

Voted, That the sum of thirty dollars ($30.00) from the income of the Warren Fund be granted to Professor H. O. Hofman of Boston, for the continuation of his research on the composition and fusibility of slags.

The annual election resulted in the choice of the following officers and committees: —

ALEXANDER AGASSIZ, *President.*
JOHN TROWBRIDGE, *Vice-President for Class I.*
ALPHEUS HYATT, *Vice-President for Class II.*
AUGUSTUS LOWELL, *Vice-President for Class III.*
SAMUEL H. SCUDDER, *Corresponding Secretary.*
WILLIAM WATSON, *Recording Secretary.*
ELIOT C. CLARKE, *Treasurer.*
HENRY W. HAYNES, *Librarian.*

Councillors.

EDWIN H. HALL,
HENRY TABER,
THEODORE W. RICHARDS, } of Class I.

BENJAMIN L. ROBINSON,
WILLIAM T. COUNCILMAN,
JOHN E. WOLFF, } of Class II.

JOHN E. HUDSON,
BARRETT WENDELL,
EDWARD ROBINSON,
} of Class III.

Member of the Committee of Finance.

AUGUSTUS LOWELL.

Rumford Committee.

ERASMUS D. LEAVITT, AMOS E. DOLBEAR,
EDWARD C. PICKERING, ARTHUR G. WEBSTER,
CHARLES R. CROSS, THEODORE W. RICHARDS,
THOMAS C. MENDENHALL.

C. M. Warren Committee.

FRANCIS H. STORER, HENRY B. HILL,
CHARLES L. JACKSON, LEONARD P. KINNICUTT,
SAMUEL CABOT, ARTHUR M. COMEY,
ROBERT H. RICHARDS.

The Chair appointed the following standing committees: —

Committee of Publication.

SAMUEL H. SCUDDER, SETH C. CHANDLER,
CRAWFORD H. TOY.

Committee on the Library.

AMOS E. DOLBEAR, G. STANLEY HALL,
SAMUEL HENSHAW.

Auditing Committee.

HENRY G. DENNY, JOHN C. ROPES.

The following gentlemen were elected members of the Academy: —

Robert DeCourcy Ward, of Boston, as Resident Fellow in Class II., Section 1 (Geology, Mineralogy, and Physics of the Globe).

Francis Cabot Lowell, of Boston, as Resident Fellow in Class III., Section 1 (Philosophy and Jurisprudence).

George Lyman Kittredge, of Cambridge, as Resident Fellow in Class III., Section 4 (Literature and the Fine Arts).

George Howard Darwin, of Cambridge, as Foreign Honorary Member in Class I., Section 1 (Mathematics and Astronomy), in place of the late James Joseph Sylvester.

Nine hundred and first Meeting.

OCTOBER 12, 1898. — STATED MEETING.

VICE-PRESIDENT HYATT in the chair.

The Chair announced the death of Samuel Eliot, Resident Fellow in Class III., Section 3; James Hall, Associate Fellow in Class II., Section 1; Thomas McIntyre Cooley, Associate Fellow in Class III., Section 1; William Ewart Gladstone, Foreign Honorary Member in Class III., Section 3.

The Corresponding Secretary read letters from G. L. Kittredge, Francis C. Lowell, F. Brunetière, G. H. Darwin, and Alb. Heim, acknowledging their election into the Academy; from Alexander Agassiz, announcing his resignation as Director and Curator of the Museum of Comparative Zoölogy at Cambridge; from the Royal Academy of Sciences of Turin, announcing the death of Carlo Giacomini and of Giuseppe Gebelli; from the Polish Association for the Promotion of Medical and Natural Knowledge, in reference to the exclusion of Poles from its meeting at Posen; from the Physico-economical Society at Königsberg, stating the subjects and conditions of award of certain prizes; from August Dauber, of Bochum, calling attention to Professor Edward Buchner's experiments made in Berlin; and from W. Potter, of Victoria, soliciting subscriptions to the Baron von Müller's grave monument fund.

A communication from the Department of State, announcing the date of the next meeting of the International Congress of Orientalists, and inviting the Academy to send delegates, was referred to a committee, consisting of the President, the Vice-President of Class III., and the Corresponding Secretary.

James Ford Rhodes, of Boston, was elected a Resident Fellow in Class III., Section 3 (Political Economy and History).

On the motion of A. G. Webster, it was

Voted, That the date of reception be placed at the head of papers received for publication, instead of or in addition to the date of presentation, so that papers may be printed, if necessary, without waiting for presentation at a meeting.

Arthur G. Webster exhibited and described Maxwell's Dynamic Top.

The following papers were read by title: —

On Certain Derivatives of Symmetrical Trichlorbenzol. By C. Loring Jackson and F. H. Gazzolo.

On the Action of Sodic Ethylate on Tribromdinitrobenzol. By C. Loring Jackson and Waldemar Koch.

Trinitrophenylmalonic Ester, Second Paper. By C. Loring Jackson and J. I. Phinney.

A Revision of the Atomic Weight of Nickel, Second Paper. The Determination of the Nickel in Nickelous Bromide. By Theodore Wm. Richards and Allerton S. Cushman.

A Revision of the Atomic Weight of Cobalt, Second Paper. The Determination of the Cobalt in Cobaltous Bromide. By Theodore Wm. Richards and Gregory P. Baxter.

The Contact-potential between Metals and Fused Salts, and the Dissociation of Fused Salts. By Clarence McC. Gordon. Presented by Theodore Wm. Richards.

Some Electrochemical and Thermochemical Relations of Zinc and Cadmium Amalgams. By Theodore Wm. Richards and Gilbert N. Lewis.

On the Thermal Conductivity of Cast Iron. By Edwin H. Hall and C. H. Ayres.

On Fluctuations in the Composition of Natural Gas. By Francis C. Phillips. Presented by the C. M. Warren Committee.

Shoreline Topography. By F. P. Gulliver. Presented by W. M. Davis.

Nine hundred and Second Meeting.

NOVEMBER 23, 1898. — SPECIAL MEETING.

The Academy met at the house of the President, Cambridge.

The PRESIDENT in the chair.

The Chair announced the death of David Ames Wells, Associate Fellow in Class III., Section 3; and of Pierre Cécile Puvis de Chavannes, Foreign Honorary Member in Class III., Section 4.

A letter was read from the Corresponding Secretary of the Colonial Society of Massachusetts, thanking the Academy for past courtesies, and requesting the use of its hall for the five stated meetings of the Society during the ensuing year.

On the motion of the Recording Secretary, it was

Voted, To grant the request of the Colonial Society.

The following papers were presented by title: —

Japanese Collembola. By J. W. Folsom. Presented by S. H. Scudder.

The Use of the Transition Temperatures of Complex Systems as Fixed Points in Thermometry. By Theodore Wm. Richards and J. B. Churchill.

The following papers were read: —

On the Relationship of the Oceanic Currents and the Pelagic Fauna. By Alexander Agassiz.

Notes. (*a*) On Allen's Application of the Indicator Diagram to Rowing. (*b*) Progress in the Use of a Ring Pendulum for Gravity Determinations. By Thomas C. Mendenhall.

Nine Hundred and third Meeting.

DECEMBER 14, 1898.

The Academy met at the Jefferson Physical Laboratory, Cambridge.

VICE-PRESIDENT TROWBRIDGE in the chair.

John Trowbridge spoke on High Tension Electricity and exhibited a number of photographs which illustrated the disruptive effects of electrical discharges.

The Academy then visited the Laboratory rooms and witnessed several experiments, among which were the passage of electrical discharges over water in preference to a path through it, and other experiments illustrating the good conducting power of air under powerful electro-motive force. Electrical discharges six feet in length in ordinary air were shown, and it was made evident that in order to submit atmospheric air to a pressure of three million volts the apparatus would have to be raised to a considerable height above the earth, and be removed from all surrounding objects. The various investigations now being pursued in the Laboratory were explained, and the apparatus shown. Among these investigations were three which are being carried on under the aid of the Rumford Committee: one on Heat Conductivity, by B. O. Peirce and R. W. Willson; one also on Heat Conductivity, by Edwin H. Hall, who explained his apparatus; and one on the measurement of very short waves of light. In this latter subject Theodore Lyman and E. H. Colpitts have succeeded in obtaining the shortest wave lengths of metals hitherto measured.

Harold Edwards explained his investigation on measurements with an improved air thermometer. H. H. Brown exhibited his apparatus for the measurement of dielectrics, and a new method of measuring electric waves in air was described and exhibited.

John E. Wolff presented the following papers by title: —

A Comparative Study of Etch-figures: the Amphiboles and Pyroxenes. By R. A. Daly.

On the Optical Characters of the Vertical Zone of Amphiboles and Pyroxenes: and on a new Method of determining the Extinction-Angles of these Minerals by Means of Cleavage-Pieces. By R. A. Daly.

Nine hundred and fourth Meeting.

JANUARY 11, 1899. — STATED MEETING.

VICE-PRESIDENT HYATT in the chair.

The Corresponding Secretary read letters from the International Geographical Congress, announcing its seventh meet-

ing at Berlin on the 28th of September, 1899; from the Royal Academy of Sciences, Letters, and Arts in Modena, announcing the death of its President, Pietro Riccardi; and from James Ford Rhodes, accepting Fellowship in the Academy.

The Chair announced the death of John Cummings, of Woburn, Resident Fellow in Class III., Section 3.

Letters of resignation were received from Mellen Chamberlain, Charles James Sprague, and Warren Upham, Resident Fellows.

The following gentlemen were elected members of the Academy: —

Arthur Amos Noyes, of Boston, as Resident Fellow in Class I., Section 3 (Chemistry).

Henry Paul Talbot, of Newton, as Resident Fellow in Class I., Section 3.

Oliver Fairfield Wadsworth, of Boston, as Resident Fellow in Class II., Section 4 (Medicine and Surgery).

Charles Doolittle Walcott, of Washington, as Associate Fellow in Class II., Section 1 (Geology, Mineralogy, and Physics of the Globe), in place of the late James Hall.

Oliver Heaviside, of Newton Abbots, as Foreign Honorary Member in Class I., Section 2 (Physics).

John Fiske gave a talk on Eccentric Literature.

Remarks on this communication were made by E. H. Hall and T. C. Mendenhall.

Nine hundred and fifth Meeting.

FEBRUARY 8, 1899.

VICE-PRESIDENT HYATT in the chair.

John E. Wolff presented, by title, a paper by R. A. Daly, On a New Variety of Hornblende.

William E. Story gave a talk on some mathematical curiosities, exhibiting and explaining some things commonly called puzzles or tricks.

Nine hundred and sixth Meeting.

MARCH 8, 1899 — STATED MEETING.

VICE-PRESIDENT HYATT in the chair.

The Corresponding Secretary read a letter from the Imperial Mineralogical Society of St. Petersburg, announcing the death of Paul Ieremeiew.

The Chair appointed the following Councillors to serve as Nominating Committee: —

EDWIN H. HALL, of Class I.
BENJAMIN L. ROBINSON, of Class II.
JOHN E. HUDSON, of Class III.

The following papers were read: —

On Hardystonite, a new Calcium Zinc Silicate from Franklin Furnace, New Jersey. By John E. Wolff.

Investigations on Periodicity in the Weather. By H. Helm Clayton.

Remarks on these papers were made by Messrs. Story, Hall, and Webster.

The following papers were presented by title: —

Contributions from the Gray Herbarium of Harvard University, New Series. — No. XV. I. *Eleocharis ovata* and its American Allies. II. *Scirpus Eriophorum* and some related Forms. By M. L. Fernald. Presented by B. L. Robinson.

Contributions from the Gray Herbarium of Harvard University. — New Series, No. XVI. I. Revision of the Genera *Montanoa*, *Perymenium*, and *Zaluzania*. By B. L. Robinson and J. M. Greenman. II. Synopsis of the Genus *Verbesina*, with an analytical Key to the Species. By B. L. Robinson aud J. M. Greenman. III. Some new Species, extended Ranges, and newly noted Identities among the Mexican Phanerogams. By J. M. Greenman.

The Orthopteran Genus Schistocerca. By Samuel H. Scudder.

Nine hundred and seventh Meeting.

APRIL 12, 1899. — ADJOURNED STATED MEETING.

The Academy met at the Mineralogical Laboratory, University Museum, Cambridge.

The PRESIDENT in the chair.

The Chair announced the death of Othniel Charles Marsh, of New Haven, Associate Fellow in Class II., Section 3.

A letter was read from the Massachusetts Historical Society, thanking the Academy for the use of its hall for the meetings of the Society during the last two years.

The following papers were read: —

The Structure and Origin of Agates, illustrated by Specimens from the Bigelow Collection, and by the Projection on the Screen, by the Arc Light, of Sections in Polarized Light. By John E. Wolff.

A new Manganese Pyroxene from Franklin Furnace. By John E. Wolff.

Petrographical Notes on some Rocks from the Fiji Islands. By A. S. Eakle. Presented by J. E. Wolff.

A TABLE OF ATOMIC WEIGHTS

OF SEVENTY-FOUR ELEMENTS.

Compiled in April, 1899, from the most Recent Data.

BY THEODORE WILLIAM RICHARDS.

Name.	Symbol.	Atomic Weight.	Name.	Symbol.	Atomic Weight.
Aluminium	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.0	Neodymium	Nd	143.6
Argon	A	39.9 ?	Nickel	Ni	58.70
Arsenic	As	75.0	Niobium	Nb = Cb	94.
Barium	Ba	137.43	Nitrogen	N	14.045
Beryllium	Be = Gl	9.1	Osmium	Os	190.8
Bismuth	Bi	208.	Oxygen (standard)	O	16.000
Boron	B	10.95	Palladium	Pd	106.5
Bromine	Br	79.955	Phosphorus	P	31.0
Cadmium	Cd	112.3	Platinum	Pt	195.2
Cæsium	Cs	132.9	Potassium	K	39.140
Calcium	Ca	40.1	Praseodymium	Pr	140.5
Carbon	C	12.001	Rhodium	Rh	103.0
Cerium	Ce	140.	Rubidium	Rb	85.44
Chlorine	Cl	35.455	Ruthenium	Ru	101.7
Chromium	Cr	52.14	Samarium ?	Sm	150.
Cobalt	Co	59.00	Scandium	Sc	44.
Columbium	Cb = Nb	94.	Selenium	Se	79.2
Copper	Cu	63.60	Silicon	Si	28.4
"Didymium"	Nd + Pr	142±	Silver	Ag	107.930
Erbium	Er	166.	Sodium	Na	23.050
Fluorine	F	19.05	Strontium	Sr	87.68
Gadolinium ?	Gd	156. ?	Sulphur	S	32.065
Gallium	Ga	70.0	Tantalum	Ta	183.
Germanium	Ge	72.5	Tellurium	Te	127.5 ?
Glucinum	Gl = Be	9.1	Terbium ?	Tb	160.
Gold	Au	197.3	Thallium	Tl	204.15
Helium	He	4.0 ?	Thorium	Th	233.
Hydrogen	H	1.0075	Thulium ?	Tu	170. ?
Indium	In	114.	Tin	Sn	119.0
Iodine	I	126.85	Titanium	Ti	48.17
Iridium	Ir	193.0	Tungsten	W	184.4
Iron	Fe	56.0	Uranium	U	240.
Lanthanum	La	138.5	Vanadium	V	51.4
Lead	Pb	206.92	Ytterbium	Yb	173.
Lithium	Li	7.03	Yttrium	Yt	89 0
Magnesium	Mg	24.36	Zinc	Zn	65.40
Manganese	Mn	55.02	Zirconium	Zr	90.5
Mercury	Hg	200.0			

(OVER)

NOTE.

Since the appearance of this table last year, the Committee of the German Chemical Society, Messrs. Landolt, Ostwald, and Seubert, have made their interesting report upon the subject, and have invited the chemists of the world to join them in deciding upon one standard to be used everywhere. The fulfilment of this very desirable end must necessarily be a matter of many months; hence the present table is republished this year in accordance with the original plan. It is to be distinctly understood that the republication is not in any way an attempt to compete with or to forestall the International Committee; it is merely an expression of opinion, which may be of temporary service. The fact that none of the other recent tables follow the accepted scientific usage concerning significant figures seems to afford an additional reason for reprinting this one.

The investigations of the past year have pointed to a change in four values given in the table of 1898. Calcium is made 40.1 instead of 40; for recent experiments (as yet unpublished) in this Laboratory indicate that last year's estimate was too low. Neo- and praseodymium were oddly transposed by their discoverer, and the more accurate values of Jones * and others are substituted. Lastly, Lenher's † careful investigation upon selenium seems to show that this element has a higher atomic weight than was formerly supposed to belong to it. For the present a compromise number, 79.2, is recorded above.

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* Am. Chem. Journ., XX. 345 (1898).

† Journ. Am. Chem. Soc., XX. 555 (1898). Compare Clarke, Ibid., XXI. 200 (1899).

AMERICAN ACADEMY OF ARTS AND SCIENCES.

REPORT OF THE COUNCIL. — PRESENTED MAY 10, 1899.

BIOGRAPHICAL NOTICES.

JUSTIN WINSOR . . . . . A. LAWRENCE LOWELL.

SAMUEL ELIOT . . . . . BARRETT WENDELL.

JULES MARCOU . . . . . ALPHEUS HYATT.

THEODORE LYMAN . . . . . HENRY P. BOWDITCH.

REPORT OF THE COUNCIL.

SINCE the Annual Meeting of May 11, 1898, the Academy has lost by death nine members: — two Resident Fellows, John Cummings, Samuel Eliot; five Associate Fellows, Alvan Wentworth Chapman, Thomas McIntyre Cooley, James Hall, Othniel Charles Marsh, David Ames Wells; and two Foreign Honorary Members, Pierre Cécile Puvis de Chavannes and William Ewart Gladstone.

JUSTIN WINSOR.

THE career of JUSTIN WINSOR is remarkable both for what he accomplished, and for the way in which he accomplished it. There is a proverb that a man must make his mark before he is thirty, or he will never make it at all; but at that age Mr. Winsor had done little to attract public attention, or to give certain promise of great future usefulness and renown. The forces of his nature were still maturing, and it was not until the middle point of life had been passed that he gave proof of effective power. But the right opportunity had no sooner been presented than his intellectual resources and the vigor of his character were displayed with marvellous rapidity. Every decade revealed him as a leader in some new field of work, and in each he was a pioneer and a master.

He was born in Boston on January 2, 1831, and got his early education there. As a boy he was exceedingly fond of reading, and kept a diary in which he entered many statistics, scraps of history, and miscellaneous notes of all sorts. But he disliked school with its tasks, and did not enter Harvard College until he was more than eighteen years old, — rather an advanced age for a Boston boy in those days. His childhood, indeed, showed more than one point of contrast with his later life, for his silent, reserved, and somewhat unsociable tendencies were no less marked in his youth than his genial sympathy was in after times. The

qualities of his boyhood followed him to college and grew stronger there. He led the same half solitary life, devoting most of his time to reading by himself. He both read and wrote with the furious energy that always characterized him; yet at the time his efforts seemed fruitless, or at least misdirected. Before coming to college he had, it is true, written a History of the Town of Duxbury, which was published in his Freshman year; but although his ambition lay in literature, he met with no further success to encourage him. He took, for example, a great interest in the stage, and wrote dramas that were never acted. In 1850 he planned a life of Garrick, and for the next fifteen years he worked upon it, collecting a vast quantity of materials, but it never saw the light. He did not abandon, however, his love for historic research, and about this time he devised a systematic method of taking and arranging notes of his reading. This he continued to employ until near the end of his life, and by its aid he accumulated a reservoir of knowledge that was invaluable when an active career opened before him.

Although essentially a scholar, Mr. Winsor paid little attention to the curriculum of the College. At last it became irksome, positively repulsive to him, and, instead of graduating with his class in 1853, he left College, with the approval of President Sparks, at the beginning of his Senior year, and sailed for Europe. The next two years he spent in Paris and Heidelberg, reading, of course, assiduously, learning the languages, and preparing a book of translations and criticisms of German poetry. This again was never published as a whole, though many parts of it afterwards appeared in a fugitive form in several magazines.

In the autumn of 1854 he came home, and the next fourteen years were passed in study, and in writing frequent literary contributions for "The Crayon," "The Round Table," and other periodicals. A great deal of work was devoted also to his life of Garrick, which was brought nearly to completion; but as yet he had not found his true career. He had been industrious, but far less successful than his talents warranted, because his immense energy had not been turned in a direction where it could be effective. It is impossible to say how long it would have been before he discovered the right path, if an accident, or something very like an accident, had not revealed it to him.

In 1866 he was appointed a Trustee of the Boston Public Library, and the next year he made a report which attracted attention, and showed that he had grasped in a most extraordinary degree the problem of managing a great public library. In fact it outlined the changes that he was himself to carry out within the next few years. It so happened

that in 1868 the Superintendent died, and Mr. Winsor was asked to take the place, at first merely as a stop-gap, but soon as the permanent successor. His career had at last begun, and was destined to grow greater and greater till his death.

Mr. Winsor's opinions on libraries were at this time somewhat heretical. He believed that, to be useful, books ought to be read, and that the more they were read, the greater their usefulness became. He therefore strove not only to permit, but to encourage, in fact even to tempt, the public to use the library freely. With this object he lowered the age at which young people were allowed to take out books, and reduced the guaranties required of borrowers. He also gave up the customary habit of closing the library for a month every year for the purpose of cleaning and of inspecting the books, and he opened new avenues to the public by establishing branch libraries in various parts of the city. But this in itself was not enough for him, nor was it the most remarkable part of his innovations. To most people, a great library is nothing but a museum of incomprehensible things, — a labyrinth in which it is impossible to find one's way. Such people are perplexed and discouraged, feeling that the treasures of a library can be used only by the few learned persons who understand such subjects. Now Mr. Winsor set to work to make threads by means of which any one could find his way through the intricate maze of books, and he devised for that purpose a system of bulletins and annotated catalogues. Here his long habits of diligent reading and study and his prodigious memory helped him, for they had enabled him to acquire a bibliographic knowledge of marvellous range.

By methods of this kind, the annual circulation of books was increased seven-fold during Mr. Winsor's nine years' tenure of office. All these things have been developed since his time to such an extent that one finds it hard to realize how recent they are. The Boston Public Library does a vast deal more for the public to-day, and gives more assistance to readers in finding books by mean of bulletins and special catalogues than ever before, and all this is a development of the policy in which Mr. Winsor was a pioneer. The result has been to make reading more general throughout the community. It may almost be said to have made a thorough use of the library possible, for with the vast growth in the number of books the public would have found their use increasingly difficult without the system of dictionary catalogues that has come into existence.

Mr. Winsor had shown that he possessed both the capacity to conceive

what a great public library should be, and the executive ability to carry out his ideas. He was soon the foremost figure among the librarians of the United States, and in 1876 he was elected the first President of the newly formed American Library Association; but as yet he was not an historian. During his stay at the Public Library, his bibliographical work was connected rather with the institution than with the progress of American history. In 1877 he was transferred from the Boston Public Library to that of Harvard University. At the Harvard Library there still lingered traces of the old pagan superstition that the worst enemy of books was the general reader, who ought to be kept away from them by every competent librarian. But times were changing. The laboratory method of instruction had been winning one field of education after another, until it was rapidly becoming universal. Now Mr. Winsor, in harmony with the views that were rapidly gaining ground with the Professors, looked upon a library as being, for educational purposes, the laboratory of the literary and historical branches of study; and he gave his most cordial co-operation in putting the largest number of books at the disposal of the students with the greatest possible freedom.

But his work at Harvard was by no means confined to increasing the usefulness of the library. Without deserting his old line of activity, he opened a new one. He continued to write and edit bibliographies on various subjects, the most notable at this period being the "Readers' Handbook of the American Revolution," published in 1879. At the same time he made a new departure by undertaking to write history. Since he published his History of Duxbury as a lad, he had never lost his interest in the subject, and had never failed to devote much time to the study of it; but for more than thirty years he had not attempted to produce a history, and, when at last he took this work up again, it was in the new and peculiar form of co-operative authorship. In his earliest venture of the kind, the "Memorial History of Boston," published in 1880–81, he divided and assigned the various portions of the work among a number of writers, while he annotated the whole himself. The first experiment was soon followed by another, the "Narrative and Critical History of America," which was prepared upon the same plan, and published in parts from 1885 to 1889. These works have been criticised on the ground that they lack unity, and that the parts are of unequal value, — defects inseparable from the co-operative authorship. In fact, they are not histories so much as storehouses of information for historical students, and in this they fulfil the purpose for which they were designed. Mr. Winsor intended them to be a bibliographical and critical

record of all the sources of American history down to the middle of the present century, and he made himself beyond question the first authority on the subject in the United States. In fact, his position among historians was recognized by his election as President of the American Historical Association, just as his standing among librarians had been shown when he was chosen President of the American Library Association ten years before. In the seventies, he had surprised the world by proving himself a great librarian. In the eighties he had become a leading historian, and the first bibliographer of American history. The nineties were to show him in still another light.

Among the subjects in which he had always been interested, and which he treasured in his note books, was the study of maps, and this in turn was developed until he became the first cartographer of the United States. He applied his knowledge of maps to the subject of the discovery of America, and made himself so distinctly the authority on the geographical questions connected with the discovery and settlement of this country that the government naturally had recourse to him in the controversy about the Venezuela boundary. In a few years he produced four remarkable books, prepared, not as the earlier ones had been, on the co-operative plan, but written entirely by himself. The first of these four books, "The Voyages of Columbus," was published in 1891; the second, "Cartier to Frontenac," appeared in 1894; it was followed the next year by his work on the "Mississippi Basin"; and finally the last of the four on the "Western Movement," was in press at the time of his death, on October 22, 1897.

Industrious, painstaking, and energetic, Mr. Winsor accomplished an incredible amount of work in the last thirty years of his life; for it must be remembered that, although his work at the Boston Public Library was doubtless more arduous than that at Harvard, nevertheless the management of the Harvard Library is no sinecure, and he was managing this with the greatest diligence and efficiency during the very years when he was writing his great works on American history. But although his life became more and more full of labor as the years went by, he did not become absorbed in his work to the exclusion of other things, — he did not become so pressed that he could not spare time for social intercourse. On the contrary, his solitary habits wore away as his own life grew fuller, and with the increase in his activity and usefulness there developed his genial social side, his warm friendship for his fellows, and his kindliness for younger men.

A. Lawrence Lowell.

SAMUEL ELIOT.

SAMUEL ELIOT, son of William Havard Eliot, whose wife was Margaret Bradford, was born in Boston on the 22d of December, 1821. In 1839 he was graduated from Harvard College. After a little experience of business life, he went abroad for a while. On his return he engaged in some schemes of charitable education, and in historical writing. In 1849 he published the first volume of his "History of Liberty"; the second followed in 1853; and in 1856 came his popular "History of the United States from 1492 to 1850." In this same year he became Professor of History at Trinity College, Hartford, Connecticut. Of this College he was President from 1860 to 1864. In 1872, having returned to Boston, where he lived thenceforth, he became master of the Girl's High School there. From 1878 to 1880 he was Superintendent of the Boston Public Schools; and afterwards, from 1885 to 1888, he was a member of the Boston School Committee.

His activity in charitable and other philanthropic work meanwhile was constant. To mention only a few of his services, he was for years a Trustee of the Massachusetts General Hospital, and during most of the time chairman of the board; for twenty six years he was President of the Perkins Institution and Massachusetts School for the Blind; and for twenty-one years President of the Massachusetts School for the Feeble Minded. He was President too of the Boston Episcopal Charitable Society. In more purely educational matters, and the like, he was equally active. For more than forty years he was a Trustee of St. Paul's School, at Concord, New Hampshire; for many years he was President of the Boston Athenæum; and from the foundation of the Boston Museum of Fine Arts until his death he was one of its Trustees. From 1866 to 1872 he was an Overseer of Harvard College. In brief, it is hard to name any position of educational or philanthropic trust in Boston which he was not called on to fill, and which he did not fill with unobtrusive distinction.

In 1863, while still President of Trinity College, he received from Columbia College the degree of LL. D.; and in 1880 he received the same honor from his own College, Harvard. In 1865 he became both a member of the Massachusetts Historical Society and a Fellow of the American Academy of Arts and Sciences. In 1853 he married Emily Marshall Otis, daughter of William Foster Otis, of Boston. Their two sons died, the younger in childhood, the elder at the age of twenty;

their daughter, Mrs. John Holmes Morison, survives. Dr. Eliot died at Beverly Farms, Massachusetts, on the 14th of September, 1898.

Among the traits which are passing from New England, and now rather enrich the memory of times gone by than give promise for the days to come, none was more marked than the personal distinction of our older gentry. The term may sound dissonant with the traditions of a democratic country. Yet whoever has known this region through the century which is closing must in candor admit that, for better or worse, we have had here social distinctions perhaps the more rigid because they were protected only by their own worth. The true worth of this New England gentry was nowhere more evident than in their deep sense of public duty. If they felt themselves born to the privilege of a certain social isolation, they felt, as every truly vital aristocracy must feel, that this privilege involved profound obligations. The older and officially recognized aristocracies of Europe find scope for their best powers in public careers, — military or political. In America, such careers, beset with far greater uncertainties than elsewhere, have proved less and less practicable for people of principle whose temper is not genuinely, unaffectedly democratic. Our first generation of independence, to be sure, found its highest ideal, military and civil alike, in Washington; our later century has found its chief civil hero in Lincoln, and its chief military hero in Grant, — admirable men, true worthies, but both alike sprung from the common people. In the generation which is passing, then, the old gentry of New England were mostly placed where they must either swerve from their traditions or do their public services elsewhere than in regular public life.

From this state of affairs has resulted a century of faithful activity in works which, while of public usefulness, are in many aspects private. Almost all of the serious literature of New England, like almost all of its riper scholarship, has been animated by its gentry. Almost all its great charities and public institutions have sprung from this class, and have been fostered by their care. To go no further than two instances familiar to all who know Boston, it is to our gentry, and almost to them alone, that we owe the Massachusetts General Hospital and the Boston Public Library, civic monuments which may serve as types of a hundred more, destined to survive any revolutions which may come, and so surviving to justify the lives and the privileges of the men to whom posterity shall owe them.

The older gentry of New England were probably at their best in a

generation which preceded Dr. Eliot's, — the generation preserved for us in the portraits of Gilbert Stuart. Their traditions, however, their principles, and to a great degree their manners, have here and there persisted; and in no familiar personality were they more typically present than in Dr. Eliot's own. His nature had a vitality, his temper a sunny freshness of feeling, — not inconsistent with occasional and sudden breezes, — which made him at seventy-five seem in many aspects almost a young man. And yet you could not see him or speak to him without the sense that here was one who could not be himself if for a moment he should strive to disguise that gracious personal distinction which marked the gentlemen of the elder time as distinct from the gentlemen of to-day and of the days to come. There was no lack of kindness in all this, no lack even of sympathetic affability, no lack of cordial human feeling such as heartily shares alike in joys and in sorrows. But there was a beautiful, impalpable something which forbade any thought or act of intrusive familiarity. His self-respect was so simple, so true, so worthy, that it could not fail instantly to command the respect of whoever had the privilege of meeting it.

For such a nature the most welcome vehicle of expression during Dr. Eliot's earlier years was probably literature, in its more scholarly aspect. Mr. Ticknor and Mr. Prescott were only a generation older than he; Mr. Motley and Mr. Parkman were his contemporaries. His earliest impulse, then, seems to have been towards that dignified and vigorous school of historical writing which is among the most precious possessions of New England. That kind of literature demands special gifts which he never quite revealed. His unfinished history shows neither such vivid power of concrete imagination as is essential to a notable historian, nor yet a vital command of style. In substance and in form alike it indicates little creative power. Whether he realized this, and so relinquished his pen, or whether the pressing call of other and more immediate duties diverted him from pure literature, it is hard to say. In either event, the experience might well have been disheartening. A man who has once felt the yearning to create works of art can seldom rest happy in any other effort. What is most characteristic of Dr. Eliot in all this, then, is that no one ever felt in him the least suggestion of disappointment or of discouragement. Among his many admirable traits, none was more salient than his constant, serene courage.

Disappointed or not, he found in the works which finally distracted him from literature opportunity for wider, more lasting usefulness than in mere letters he would ever have achieved. Very various these works

seem; yet all agree in being at once private in form and public in scope. Though the superintendence of the Boston Public Schools may technically be held a public office, and surely is exposed to that ignoble kind of attack which to-day makes public office most repugnant to sensitive natures, it was in his hands as free from actual complication with politics and the like as was Trinity College, or the Athenæum, or St. Paul's School. His true career, then, through all the riper years of a manhood unbroken until the very end, was that of a faithful public servant, whose service was done in the unofficial retirement of privacy.

Professionally, so far as he can be held to have had a regular profession, he became a teacher, or perhaps one should rather say he devoted himself to education. As a Professor at Trinity College and for a while its President, as master of the Girls' High School in Boston and later as Superintendent of the Public Schools there, and for years as a Trustee of St. Paul's School at Concord, New Hampshire, he exerted a wide, varied, and constantly thoughtful influence on the education of New England. Precisely to define the nature of this influence and its result is needless. One thing about it seems certain. Wherever it was felt, and wherever it has persisted, it tended and it tends toward that sure righteousness of spirit which must come from ardently and constantly cherished ideals. In his public school work, to be sure, the condition of our society forbade him actively to assert the ideal which with him was doubtless the most profound. In his work at Trinity College, on the other hand, and in his constant watchfulness over St. Paul's School, he was able to care for this with all his heart and with all his power. For these, college and school alike, are not only institutions of learning but seminaries of religion, — and religion in that form which seemed to him most true, the gentle and flexible dogmatism of the Protestant Episcopal Church.

Not professedly religious, any more than was his work in the public schools, the other great range of his mature activity had in it something akin to consecration. In our time it has generally proved wisest to separate charity from dogma, — to serve the suffering and the wretched with no question as to anything but their sufferings and their needs. To charitable work, and especially such charitable work as should directly alleviate suffering, he gave himself with all his heart. The Massachusetts General Hospital, the Perkins Institution for the Blind, and many another admirable expression of the broadly humane benevolence which has marked our passing New England, owe as much to him as to any name in their history. In the coming time, to be sure, little distinct trace

of him may remain. This makes small difference; such work as his has the supreme grace of permeating that with which it deals. More and more, as one considers it, one feels that, for all the distinction of presence which in life made him always seem a personage, he labored in full humility of spirit, as a servant of the Master to whom his loyalty never wavered.

For, beyond doubt, the deepest trait of his true character was the simple fervor of his religious faith, a faith which sustained him in every trial, which inspired him in every duty. A single example of this will recur to whoever saw him in what must have been among the most trying moments of his later years. At a meeting in memory of an old friend, for whom he had personally cared, and whose character and life he had deeply respected, he was called on, amid the general eulogy, to pay his own tribute to the departed. He did not speak long; and he spoke kindly, gently, appreciatively. But you felt in his speech a touch of hesitation, a touch even of chill, which you did not quite understand. Then finally, — very simply, but very firmly, and with a rigidity of face which showed a rigid sense of duty impelling him, — he told us that he could not truthfully refrain from expressing his deep sorrow that our friend who was gone had not crowned a character which was almost complete by the final grace of Christianity. Written down, this act of his may seem bigoted, tactless, narrow. What made it so admirably memorable to those who witnessed it was the noble fearlessness of its conscientious sincerity, — a trait which freed it from all the invidiousness it might have had if the words had fallen from any other lips than his.

Such a memory of him as this might seem to imply that a dominant trait of his personal presence was austerity. Nothing could be further from the truth. It is doubtful, indeed, whether any of those who had the privilege to know him in the hearty intercourse of his private life, will remember anything of him sooner or more constantly than his simple, wholesome sense of humor. It was not that he uttered clever things, or told stories, or gave himself over to any conventional whimsicalities of thought or phrase. But in the unfailing oddities of daily life, in a thousand turns of fact or of speech which to most of us would seem commonplace, he found, with something like boyish zest, inexhaustible stimulus to such hearty, spontaneous laughter as speaks at once untrammelled power of enjoyment, unfailing sympathy with the little failings and vexations and absurdities of human beings, and all the while a singular purity of spirit.

Purity of spirit is what one finally feels to have been his rarest gift.

There were moments, no doubt, when this asserted itself in a somewhat rigid way. No man ever believed more firmly in the principles which his faith and his experience had combined to teach him; and, as the years passed, these principles had in them enough of the old school sometimes to formulate themselves in a manner which came very near to prejudice. Then appeared that firmness of feature from which every trace of laughter or mirth, of everything but deep, earnest conviction, had all faded. Then, instead of buoyant, cheery words came words of marked, cool, and sometimes sharp decision. And yet even in moments like these, when to those who did not wholly share his opinions and feelings his motives seemed least liberal, there was always an underlying, evident truth and simplicity of heart which brought, even with a sense of unmerited reproof, a feeling of tenderness for him. Like all of us, he was human, with foibles and with failings which he would have been the last to dissemble or to deny. He had the limits and the prejudices of his race and of his time; but more surely still he possessed the virtues of that vanishing old New England whose traditions he so loyally preserved to the end.

"Integer vitæ, scelerisque purus," wrote the Roman poet; and for centuries the words have been held to typify such a character as so lately has passed from among ourselves. And there is another saying, a sacred one which he would have cherished most, with little thought of how truly we who are left can repeat it of him: "Blessed are the pure in heart; for they shall see God."

BARRETT WENDELL.

JULES MARCOU.

JULES MARCOU, the subject of this notice, was born at Salins, France, April 20, 1824. He was educated at the College of Salins and the Lyceum of Besançon, and entered the College of St. Louis at Paris in October, 1842, but retired on account of ill health occasioned by too great application to mathematical studies in the spring of 1844, and returned to his native place. Previous to this three papers upon mathematical subjects had been accepted and published in the "Nouvelles Annales de Mathématiques," Terquem et Gérono, Paris, 1843–44.

By the advice of his family physician, Dr. Germain, he made long excursions on foot into the country around his native city, and in order to give objective interest to these walks collected and studied plants

with such energy that the knowledge obtained was of use to him in his subsequent work. Dr. Germain was in his leisure hours an enthusiastic collector of fossils, and possessed a considerable series of these which he had gathered himself. The interest excited in Marcou's mind by talks with Dr. Germain over his collection, and by tramps in company with him to deposits of organic remains in the strata of the Jura, gradually turned his attention from botany to the more exciting and absorbing pursuit of geology. The astonishingly active and original mind possessed by young Marcou, however, soon got beyond the stage of development reached by his teacher, and he speedily repaid his assistance by greatly increasing the value of his collections through his work in arranging, describing, and naming the specimens.

In consequence of his rising reputation Marcou was visited by Thurmann, then one of the most prominent of Swiss geologists, and also by Louis Agassiz. Both of these men, especially the latter, had great influence upon his subsequent career. It was largely owing to their encouragement that he offered for publication, in 1845, his first geological work, "Recherches Géologiques sur le Jura Salinois," which was published in "Mémoires de la Société d'Histoire Naturelle de Neuchâtel," of which Louis Agassiz was then editor, and subsequently appeared in fuller form in the "Mémoires de la Société Géologique de France," in 1846. The excellence of this work and his high recommendations made him the favored candidate for the chair of Professor of Mineralogy at the College of the Sorbonne in Paris in 1846. In 1847 he was intrusted with the important work of classifying the collections of fossil shells and corals in the Jardin des Plantes, and is said to have completed this task within a year, and so satisfactorily that he was offered by the great botanist Jussieu, then Director of the Jardin des Plantes, the position of Travelling Geologist, lately made vacant by the assassination of the former incumbent in Peru. This hazardous but much sought for post was exactly suited to his taste, and he accepted it joyfully, choosing for his field of exploration North America, principally on account of the presence of his friend Louis Agassiz in the United States.

His first expedition after his arrival in May, 1848, was with Agassiz upon the Lake Superior expedition in the same year; but he left the party at Keeweenaw Point to engage in the study of the copper bearing rocks of that region. His activity in travelling and collecting was at this time prodigious, and the mere list of the places visited and explored would be too long for so limited a notice as can be given here. He sent back to France large collections from many localities, ranging from

Richmond, Virginia, to Cape Breton and Quebec in Canada, and even as far west as Pittsburg and Cincinnati and Lake Superior.

In 1850 he married Miss Jane Belknap of Boston, and from that time he was actively seconded and assisted by this lady, whose devotion lightened the strains of his severest trials, including even that of his last sickness. Soon after his marriage he went back to France with his wife, but resigned before doing so the arduous post of Travelling Geologist, the duties of which had already begun to tell upon his not over strong constitution. He returned to America the following year, and immediately began the more minute study of the geology of New England, and also to write his "Geology of North America," the first work that attempted to assemble what was then known of the geology of this continent. This was published in 1853, and gave him naturally the best claim to be appointed geologist of one of the great expeditions then being organized by the United States for the survey of feasible routes for the projected railroads which were destined to unite the Atlantic and Pacific seaboards.

Professor Marcou accompanied the expedition under command of Lieutenant Whipple, which took the most southern route, departing from Napoleon on the Mississippi at the mouth of the Arkansas River in 1853. The main geological results of this expedition were the discovery of the wonderful structure of the great plateaus and the enormous deposits of secondary rocks in the Southwest, especially in the neighborhood of the Red River, and, although the age of these has since been settled differently from what was maintained by Professor Marcou, the importance of the facts and the credit due him as their first explorer have always been acknowledged. Unfortunately ill health obliged him to leave the United States for Europe in 1854, and he was forced to resign his position, and give up the hope of publishing his results in the official reports of the United States Survey.

The notes he had made were edited by W. P. Blake, and appeared in the Report published by the Senate, entitled "Explorations and Surveys of a Railroad Route from the Mississippi River to the Pacific Ocean," Vol. III., Washington, 1856.

Marcou was never satisfied with this necessarily meagre presentation of his views, and subsequently himself published a "Geology of North America, with two Reports on the Prairies of Arkansas and Texas, the Rocky Mountains of New Mexico, and the Sierra Nevada of California, originally made for the United States Goverment," Zurich, 1858, with three maps and seven plates of fossils.

He was appointed Professor of Paleontology at the École Polytechnique at Zurich in 1856, and taught there for four years. The spirit of investigation and untiring devotion to science, however, was as great during this time as in previous years, and he continued publishing at intervals works of great importance upon the Jura, and began to write the manuscript of his "Geological Map of the World." The difficulties of this last work, including as it did extended correspondence with geologists in all parts of the world, and a vast amount of reading and compilation, were overcome only by untiring critical study and hard work; but the first and to the present time the only "Geological Map of the World" was constructed and finally published by him in 1862. This was the acme of his career, and probably no other geologist of his generation was so well qualified to accomplish such a general statement of what was then known of the geology of the world, and it must necessarily become the point of departure for all subsequent maps of this class.

Marcou resigned his professorship at Zurich, and returned to America in 1860 before this map was out of press, and there became involved in the great controversy with regard to Emmons's Taconic system of rocks. This, and the trips that he made into parts of New England in order to establish the credit of Emmons's discoveries of a primordial fauna, did not prevent him from making long journeys on his own account. We find him in the summer of 1863, during the dangerous times of the Civil War, exploring the country traversed by the Platte River and lying between the Kansas and Big Sioux. In 1875 he accompanied as geologist one of the expeditions under Lieut. Geo. M. Wheeler, which surveyed a portion of Southern California starting from Los Angeles, and his results were given in a "Report on the Geology of a Portion of Southern California" that appeared in the Report of Lieut. Wheeler's "Geographical Surveys West of the 100th Meridian" for 1876, included in the "Report of the Chief of Engineers," Part III., 1876. This seems to have been his last expedition to far western localities, and the remainder of his life was filled by one or two trips to and from Europe, and the writing of numerous papers mostly upon geology and of a controversial nature.

The biological side of his profession was regarded by Marcou as subservient to geology. In other words, he as a rule looked upon fossils mainly from the side of their importance in determining the age of strata, and yet to him belongs the credit of highly important results of a purely biological character. He was the first author to lead off in the effort to synchronize the different faunas of the Jura in Europe, and

Oppel, the most successful worker in this direction, always looked up to him as his teacher.

The eminent geologist of Vienna, Neumayr, and the author of this notice have always regarded themselves as following in his footsteps when endeavoring to map out the limits of the zones of life in geologic time, since Marcou in his "Roches des Jura" was the first author to distinctly define such areas of distribution. In that work he described tropical, temperate, and polar divisions in the Jura, and showed that the faunas of these circumterrestrial "bands" were distinguishable through the different characteristics of their faunas.

The writer's acquaintance with Prof. Marcou began during his first years of student life in Cambridge, and the kindly and courteous sympathy extended to him and to others was doubly grateful, since in those days personal interest and social intercourse between men in his position and students were exceptional.

Prof. Marcou's bibliography is extensive, one hundred and eighty-one titles being given in his manuscript list, extending from 1843 to the year of his death, 1898. This list shows that he completely gave up his early mathematical bent for geology, but he made one or two excursions into the domain of anthropology, and also into history, in his discussions of "the origin of the name America."

His most important independent work outside of geology was perhaps a book of 324 pages octavo, entitled, "De la Science en France," which appeared in 1869 in Paris, and excited great interest through its criticism of the official methods of conducting scientific institutions in that country. Another was a lively and interesting biography, the "Life, Letters, and Works of Louis Agassiz," in two volumes, 620 pages octavo, which appeared in this country in 1896.

Marcou was elected to membership in this Academy in November, 1861, and was also a member of the Geological Societies of London, Paris, Vienna, and Berlin. Numerous geographical and natural history societies had also honored him by election in France, Switzerland, Belgium, Russia, Germany, the United States, San Salvador, Mexico, Canada, Algeria, and Mozambique.

He was a lover of books, and his library contained a number of rare volumes, which he was always liberal in lending to investigators, and the writer frequently received assistance from him in this and in other ways that cannot be too gratefully acknowledged.

His acquaintance and correspondence with distinguished men in Europe and America were extensive and often intimate, and embraced many

illustrious persons outside of his own profession. His retentive memory was stored with reminiscences of personal intercourse with them, that at times made his conversation of surpassing interest.

His health during many years of his life was not good, and he was obliged to consider himself an invalid; but nevertheless his power of mental exertion remained apparently undiminished, and continued active until his last illness. He died at Cambridge, April 17, 1898, in consequence of an attack of pneumonia from which his enfeebled constitution was unable to rally. Had he lived three days more, he would have reached his seventy-third birthday.

ALPHEUS HYATT.

THEODORE LYMAN.

Resident Fellow Class II., Section 3, November, 1859. — Treasurer 1877–1883. — Secretary of Committee on the 100th Anniversary of the Founding of the Academy.

THEODORE LYMAN was born in Waltham, Mass., on the 23d of August, 1833, and died at Nahant, Mass., on the 9th of September, 1897. He was of the seventh generation in descent from Richard Lyman, the ancestor of the family, who came to this country in 1631 in the same ship with John Eliot, and the third successive bearer of the name Theodore Lyman.

The first Theodore Lyman, the grandfather of our late associate, came from old York, Maine, to Boston, and, as a successful merchant in this city, laid the foundation of the family fortunes.

His son, the second Theodore Lyman, studied in Europe in his early life, and, returning, served in the State Legislature from 1820 to 1825. He was Mayor of Boston in 1834–35, and while in this office defended William Lloyd Garrison from personal violence at the hands of a mob of respectable rioters to whom the fearless course of the abolitionist leader had given grave offence. Mayor Lyman secured the foundation of the Massachusetts State Reform School at Westboro, now appropriately known as the Lyman School, in grateful recognition of his endowment of the institution with a fund amounting to $72,500. He was a generous friend to the Massachusetts Historical Society, and to the Boston Farm School, an institution over which his son presided for several years. He was the author of works upon "The Political State of Italy" and "The Diplomacy of the United States," of small volumes entitled "Rambles in Italy" and "A few Weeks in Paris during the Residence of the Allied Sovereigns in that City," and of a Fourth of July Oration delivered in 1820.

The subject of the present sketch inherited his distinguished father's physique, as well as his intellectual traits and his strong sense of civic duties. He secured his early education from private instructors, spending two years in Europe from 1847 to 1849. While in Paris he suffered from a severe attack of typhoid fever, and also from weakness of the eyes. Returning home in 1849, he entered Harvard College in the Class of 1855, having among his classmates Alexander Agassiz and Phillips Brooks. During his college course we find evidences of his literary activity in the pages of the Harvard Magazine, a periodical founded by the classes of 1855 and 1856, but destined to be short-lived.

As if anticipating a career which was ten years later to engross his whole life and thought, his contributions were frequently upon military subjects, on which, as his classmate F. B. Sanborn says, "he joked with a substratum of excellent sense." His literary reputation as a student will, however, always rest securely on the song in which, as Chorister of the Hasty Pudding Club, he described the mystical origin of that ancient fraternity.

After graduation he studied for three years under the guidance of Prof. Louis Agassiz, and in 1858 received the degree of S. B. *summa cum laude.* The impressions produced upon him at this period of his life are recorded in an article entitled "Recollections of Agassiz," published in the Atlantic Monthly in 1874. The direction given to his studies by his great master was maintained during his whole life, and in recognition of the high value of his biological work his Alma Mater bestowed upon him in 1891 the honorary degree of LL. D.

Theodore Lyman's first public service was rendered in 1859–60 as a Trustee of the Reform School, which had been founded by the State at the instance and with the help of his father, for the instruction, employment, and reformation of juvenile offenders unfit to be at large, but not for boys who had become hardened by a prolonged vicious course, who were bad themselves and fitted to make others bad. By degrees however this purpose had been lost sight of, and vicious youths up to sixteen years of age had been committed to the School. The natural consequences ensued. $50,000 worth of property was destroyed by the burning of newly erected buildings by a boy who thus attempted to secure an alternate sentence, i. e. a short sentence to a penal institution, instead of being kept under guardianship at the School during minority. A return to the original plan of the founders of the School was secured through the strenuous exertions of Theodore Lyman, who, though the youngest member of the board, evidently prevailed in their counsels through the

same effective courage and energy which marked his later career, and did not quit the work until the Legislature had fixed the age limit at fourteen years, and had done away with the alternate sentence, placing all the boys in the School's custody during minority. It was not until 1884, when the Massachusetts Reformatory was established at Concord, that the age limit at Westboro was fixed at fifteen years, and provision was made for the transfer to Concord of boys who should prove to be unfit subjects for the Reform School, which was now by act of Legislature called "The Lyman School for Boys." A few years after its removal to a neighboring farm in the town of Westboro, Theodore Lyman came to the School for the dedication of the chapel, and, as he watched the boys at their work and play, he expressed his satisfaction at the success of the trustees in having at last made it very nearly the kind of school that his father had wished and hoped that it might become.

Theodore Lyman was married on November 28, 1856, to Elizabeth Russell, eldest daughter of George R. Russell, and a few years later went abroad for two years. It was during this period that his daughter Cora was born, in 1862. Returning home in 1863, he at once entered the military service of his country, then in the throes of civil war. He secured a commission as volunteer aid of the Governor of Massachusetts with the rank of Lieutenant Colonel, and was assigned to special duty at the headquarters of General Meade, with whom he had become very well acquainted before the war, and who was then in command of the Army of the Potomac. In this capacity he served till the end of the Civil War, taking part in the battles of the Wilderness, Spottsylvania Court House, and Cold Harbor, in the movements around Petersburg and in the final surrender at Appomattox Court House, where he was one of the few officers privileged to ride through the Confederate lines after the surrender. During all this period he showed an active and intelligent interest in his new work by making almost daily sketches showing the positions of the different corps of the Army of the Potomac. Mr. John C. Ropes, President of the Military Historical Society of Massachusetts, writes that he "was so much impressed with the value of these cartographic statements of the movements of the Army of the Potomac, from the autumn of 1863 down to and including the 9th of April, 1865, when Lee surrendered," that he had them all copied for the use of the Society. The same high authority in military matters speaks also of having seen extracts from a diary kept by Theodore Lyman during this period, "which are as humorous and as entertaining as any pictures of the camp

and march can possibly be." It is greatly to be hoped that this diary may in due time be edited and published, as it cannot fail to be a valuable contribution to our knowledge of the civil war. Few actors in this great drama had better opportunities of watching the succession of important historical events, or minds better qualified for observing, recording, and commenting upon them. Nor did his interest in military matters cease with the war, for, as a member of the Military Historical Society of Massachusetts he had ample opportunity to discuss with his companions in arms the great events in which they had all taken part. On June 11, 1877, he read a "Review of the Reports of Colonel Haven and General Weld on the conduct of General McClellan at Alexandria, in August, 1862, and on the case of Fitz John Porter."

Lyman maintained a close and unbroken friendship with General Meade until the death of the latter, in 1872. He then wrote an obituary notice of his old commander, which was published in Volume IX. of the Proceedings of this Academy.

During the twenty years following the close of the civil war Theodore Lyman's life was one of abounding activity, though before the end of this period the dread disease which was to make the closing years of his life a continual martyrdom had already marked him for its own.

To his Alma Mater he rendered important services as Overseer from 1868 to 1880, and from 1881 to 1888. Here his influence was always thrown in favor of liberty in the choice of studies and in attendance upon religious services. He was also one of the original Trustees and Treasurer of the Zoölogical Museum, a member and Secretary of the Museum Faculty, and Assistant in Zoölogy. The value of his services to the Museum in these various capacities was gratefully acknowledged by the Director, Alexander Agassiz, who, in his Annual Report for 1896–97 thus speaks of Lyman's scientific work: "His zoölogical work began with short papers on ornithological subjects; he subsequently became interested in corals, and finally devoted himself specially to Ophiurans. The first Illustrated Catalogue of the Museum was from his pen, and this important monograph on Ophiurans was followed by numerous papers on the same subject, treating of new species of the group. He wrote the Report on the Ophiurans of the 'Hassler' Expedition, of the 'Challenger,' and of the 'Blake,' which include by far the larger number of species of Ophiurans dredged by those deep-sea exploring expeditions."

On the establishment of the Commission of Inland Fisheries in 1866, Theodore Lyman became its first Chairman, and gave the State devoted

service for seventeen years without compensation. The story of his disinterested labor in this field is told in the Commissioners' Annual Reports, many of which are from his own pen, and are characterized by a brightness of style which pleasantly relieves the gravity of an official document.

In 1884, as President of the American Fish Cultural Association, at the thirteenth annual meeting held in Washington on May 13, he delivered an address which is printed in the 19th Annual Report of the Commissioners of Inland Fisheries of Massachusetts. Here he sketches in the most charming manner the history of the fish industries of New England from the time when the inhabitants were wont to "dunge their grounds with codd." He shows that fifty years after the settlement of the country a diminution in the number of fish in the New England rivers had already been noted, and describes the various laws enacted for their protection, culminating in 1864–65 in modern fish culture under the auspices of several State governments, and finally in the appointment in 1871 of the United States Fish Commission under the leadership of Professor Spencer F. Baird.

The various fishery commissions of the country have, to use Theodore Lyman's own words, "accumulated a vast amount of accurate information concerning the numbers and variety of our fishes, their food, manner of breeding, condition of life, migration, and stages of growth." Pisciculture has become a State and national industry, while many private fish preserves have been established in various parts of the country. Several species of Salmonidæ are raised regularly for the market, and it is highly probable that nearly all the shad now taken in our Atlantic streams have originated in State or national hatching establishments. These results, though important, merely serve to indicate what great additions to the wealth of the country may be effected when water culture is "practised as universally and methodically as is agriculture." When Americans shall have learned to cultivate the water thus methodically, and shall desire to honor the men who in their day and generation have labored to re-establish the fisheries of the country, no name will stand higher on the list than that of Theodore Lyman.

In politics Theodore Lyman was distinguished for independence and an earnest advocacy of civil service reform, a cause which, as founder and Vice President of the Massachusetts Reform Club, he sought in every way to promote. He was elected to Congress from the Ninth District in 1882, and, though handicapped by increasing infirmities, nobly represented the State "as long as patriotism was more prized in his district

than partisanship."* His independent course in politics was naturally distasteful to many political leaders, and, at the time of the "Mugwump" defection from the Republican party, called down upon him some severe animadversions from Senator Hoar. On this occasion he, with exquisite humor and with generous consideration for his antagonist, compared himself to a fellow who boasted to his neighbors that he had "just been cuffed by the King."

In November, 1869, he was elected a Resident Member of the Massachusetts Historical Society, and in December, 1880, he read before the Society a memoir of his father-in-law, George R. Russell.

He was also a Trustee of the Peabody Educational Fund.

Theodore Lyman did so much work of a high order in so many different directions that it is difficult to decide in what calling he was most fitted to excel. That he possessed a decided aptitude for the duties of a soldier is the opinion of those best qualified to judge, and it is not at all improbable that when, in the fulness of time, his diary shall be given to the public, his place among the military writers of the world will be definitely assured.

His high character and his firm conviction that "public office is a public trust" well fitted him for the career of a statesman, and there is little doubt that he would have distinguished himself in public life had circumstances favored the adoption of such a career.

His scientific papers are examples of conscientious observation, and are valuable contributions to the field of knowledge in which he labored.

Perhaps the trait of character which most impressed itself upon all who came in contact with Theodore Lyman was the cheerfulness and gayety of his disposition. This gayety was far removed from frivolity, and was compatible with a stern expression of indignation whenever circumstances called it forth. In this spirit were compiled the "Papers relating to the Garrison Mob,"† in which the son indignantly repels the criticisms of Wendell Phillips upon the conduct of the father on that memorable occasion.

Another remarkable trait in Theodore Lyman's character was the alertness of his mind, which, combined with the gayety of his nature, made his companionship both socially and intellectually so charming. Even in his serious writings, e. g. in his Reports as Fish Commissioner, his exuberant vitality and his cheerful humor found expression, but it was, of

* "H. L.," Transcript, Sept. 15, 1897.

† Cambridge, Welch, Bigelow, & Co., 1870.

course, in his personal intercourse with his companions that this charm was most distinctly felt. It was this which led to his being for many years, by common consent, chairman of his Class dinners, as the Class Secretary E. H. Abbot tells us in a most appropriate and affectionate notice of him prepared for distribution to the members of the Class of 1855.

The members of the Thursday Evening Club, over which he presided for many years, will long remember the way in which the meetings were enlivened by his ready wit, and the happy manner in which he introduced the successive speakers.

Upon this life, so filled with everything that could make life enjoyable, early fell the shadow of a mortal disease, so gradual in its approach that few of his friends were aware that the first warning came sixteen years before his death. During this period he was, in the words of his friend and classmate, E. H. Abbot, "day by day parting with the power to act, until at last he was forced to stand still and watch the stream of life flow by; a soul imprisoned in a body which was gradually losing all power of movement, and which at last became absolutely helpless and dependent for every service upon external aid. To him of all men these years of prolonged and growing uselessness must have seemed a living death. And yet they who know most about him know that those years were really the noblest of his life. His brave spirit in this growing isolation, which at last withdrew him from the sight of almost all except his own family, surmounted all barriers. He never permitted himself to lose his active interest in the events of other lives. He cheered on the doers of good all over the world by messages which came from his chamber with all their old-time gayety and brightness. When his hand could no longer hold the pen, he spoke through his tender amanuensis words full of the same high courage and cheerful humor which had been his charm in earlier life."

In concluding this brief notice of Theodore Lyman, it may perhaps be permitted to supplement the above tender and truthful description of his last years with a few words employed by the writer of this sketch to introduce a resolution of the Thursday Evening Club replying to an affectionate message from its former President on the fiftieth anniversary of its foundation: —

"I remember, Mr. President, when a young man, looking around among the men of my generation and considering whose lot in life seemed to me, on the whole, the most enviable. I came to the conclusion that Theodore Lyman was, of all my acquaintances, the man for whom the future seemed to hold out the brightest promise.

"In vigorous health, with a personality physical, mental, and moral which endeared him to all who came in contact with him, happily married, with instincts and powers which led him to the highest callings, to the service of his country in the field and in legislative halls, with tastes for the study of the natural sciences and abundant means to gratify them, there seemed to be nothing lacking to make his life an ideally happy one.

"Then, when the shadow of a slow insidious disease fell upon him, it seemed for a time as if his life were but to afford another illustration of the old Greek saying that no man is to be judged happy before his death. But when I saw how bravely he met the advances of his enemy, and with what courageous cheerfulness he interested himself in the pursuits of his friends and in the active life around him in which he could no longer share, I could not help feeling that a happiness was reserved for him higher than any of which the Greek philosopher had dreamed, or I, as a young man, had formed a conception, — the happiness of knowing that by the force of his example he had helped to raise those who came under its influence to a higher and nobler life."

HENRY P. BOWDITCH.

Other notices are postponed.

Three Resident Fellows have resigned, and the Academy has received an accession of seven Resident Fellows, one Associate Fellow, and two Foreign Honorary Members.

The roll of the Academy, corrected to date, includes the names of 193 Resident Fellows, 92 Associate Fellows, and 66 Foreign Honorary Members.

BOSTON, May 10, 1899.

LIST

OF THE

FELLOWS AND FOREIGN HONORARY MEMBERS.

(Corrected to June 1, 1899.)

RESIDENT FELLOWS. — 195.

(Number limited to two hundred.)

Class I. — *Mathematical and Physical Sciences.* — 78.

Section I. — 18.

Mathematics and Astronomy.

Solon I. Bailey,	Cambridge.
William E. Byerly,	Cambridge.
Seth C. Chandler,	Cambridge.
J. Rayner Edmands,	Cambridge.
Gustavus Hay,	Boston.
Henry Mitchell,	Nantucket.
James Mills Peirce,	Cambridge.
Edward C. Pickering,	Cambridge.
William H. Pickering,	Cambridge.
John Ritchie, Jr.,	Boston.
John D. Runkle,	Brookline.
T. H. Safford,	Williamstown.
Edwin F. Sawyer,	Brighton.
Arthur Searle,	Cambridge.
William E. Story,	Worcester.
Henry Taber,	Worcester.
O. C. Wendell,	Cambridge.
P. S. Yendell,	Dorchester.

Section II. — 23.

Physics.

A. Graham Bell,	Washington.
Clarence J. Blake,	Boston.
Francis Blake,	Weston.
John H. Blake,	Boston.
Charles R. Cross,	Brookline.
Amos E. Dolbear,	Somerville.
H. M. Goodwin,	Boston.
Edwin H. Hall,	Cambridge.
Hammond V. Hayes,	Cambridge.
Silas W. Holman,	Brookline.
William L. Hooper,	Somerville.
William W. Jacques,	Newton.
Frank A. Laws,	Boston.
Henry Lefavour,	Williamstown.
T. C. Mendenhall,	Worcester.
Benjamin O. Peirce,	Cambridge.
A. Lawrence Rotch,	Boston.
Wallace C. Sabine,	Cambridge.
John S. Stone,	Boston.
Elihu Thomson,	Swampscott.
John Trowbridge,	Cambridge.
A. G. Webster,	Worcester.
Robert W. Willson,	Cambridge.

Section III. — 23.

Chemistry.

Samuel Cabot,	Boston.
Arthur M. Comey,	Cambridge.
Thos. M. Drown,	So. Bethlehem, Pa.
Charles W. Eliot,	Cambridge.
Thomas Gaffield,	Boston.
Henry B. Hill,	Cambridge.
Charles L. Jackson,	Cambridge.

Walter L. Jennings,	Worcester.
Leonard P. Kinnicutt,	Worcester.
Charles F. Mabery,	Cleveland, O.
Arthur Michael,	Boston.
George D. Moore,	Worcester.
Charles E. Munroe,	Washington.
John U. Nef,	Chicago.
Arthur A. Noyes,	Boston.
Robert H. Richards,	Boston.
Theodore W. Richards,	Cambridge.
Charles R. Sanger,	Cambridge.
Stephen P. Sharples,	Cambridge.
Francis H. Storer,	Boston.
Henry P. Talbot,	Newton.
Charles H. Wing,	Ledger, N. C.
Edward S. Wood,	Boston.

SECTION IV. — 14.

Technology and Engineering.

Eliot C. Clarke,	Boston.
Ira N. Hollis,	Cambridge.
Gaetano Lanza,	Boston.
E. D. Leavitt,	Cambridgeport.
William R. Livermore,	Boston.
Hiram F. Mills,	Lowell.
Cecil H. Peabody,	Boston.
Alfred P. Rockwell,	Manchester.
Andrew H. Russell,	St. Paul, Minn.
Peter Schwamb,	Arlington.
Charles S. Storrow,	Boston.
George F. Swain,	Boston.
William Watson,	Boston.
Morrill Wyman,	Cambridge.

CLASS II. — *Natural and Physiological Sciences.* — 61.

SECTION I. — 12.

Geology, Mineralogy, and Physics of the Globe.

H. H. Clayton,	Milton.
Algernon Coolidge,	Boston.
William O. Crosby,	Boston.
William M. Davis,	Cambridge.
Benj. K. Emerson,	Amherst.
O. W. Huntington,	Newport, R. I.
Robert T. Jackson,	Boston.
William H. Niles,	Cambridge.
John E. Pillsbury,	Boston.
Nathaniel S. Shaler,	Cambridge.
Robert DeC. Ward,	Boston.
John E. Wolff,	Cambridge.

SECTION II. — 10.

Botany.

Geo. E. Davenport,	Medford.
William G. Farlow,	Cambridge.
Charles E. Faxon,	Boston.
George L. Goodale,	Cambridge.
H. H. Hunnewell,	Wellesley.
John G. Jack,	Boston.
B. L. Robinson,	Cambridge.
Charles S. Sargent,	Brookline.
Arthur B. Seymour,	Cambridge.
Roland Thaxter,	Cambridge.

SECTION III. — 24.

Zoölogy and Physiology.

Alexander Agassiz,	Cambridge.
Robert Amory,	Boston.
James M. Barnard,	Milton.
Henry P. Bowditch,	Boston.
William Brewster,	Cambridge.
Louis Cabot,	Brookline.
Samuel F. Clarke,	Williamstown.
W. T. Councilman,	Boston.
Charles B. Davenport,	Cambridge.
Harold C. Ernst,	Boston.
J. Walter Fewkes,	Washington, D.C.
Edward G. Gardiner,	Boston.
Samuel Henshaw,	Cambridge.
Alpheus Hyatt,	Cambridge.
John S. Kingsley,	Somerville.
Edward L. Mark,	Cambridge.
Charles S. Minot,	Boston.
Edward S. Morse,	Salem.

George H. Parker,	Cambridge.
James J. Putnam,	Boston.
Samuel H. Scudder,	Cambridge.
William T. Sedgwick,	Boston.
James C. White,	Boston.
William M. Woodworth,	Cambridge.

SECTION IV. — 15.

Medicine and Surgery.

Samuel L. Abbot,	Boston.
Edward H. Bradford,	Boston.
Arthur T. Cabot,	Boston.
David W. Cheever,	Boston.
Frank W. Draper,	Boston.
Thomas Dwight,	Boston.
Reginald H. Fitz,	Boston.
Charles F. Folsom,	Boston.
Frederick I. Knight,	Boston.
Samuel J. Mixter,	Boston.
W. L. Richardson,	Boston.
Theobald Smith,	Boston.
O. F. Wadsworth,	Boston.
Henry P. Walcott,	Cambridge.
John C. Warren,	Boston.

CLASS III. — *Moral and Political Sciences.* — 56.

SECTION I. — 10.

Philosophy and Jurisprudence.

James B. Ames,	Cambridge.
Charles C. Everett,	Cambridge.
Horace Gray,	Boston.
John C. Gray,	Boston.
G. Stanley Hall,	Worcester.
Nathaniel Holmes,	Cambridge.
John E. Hudson,	Boston.
Francis C. Lowell,	Boston.
Josiah Royce,	Cambridge.
James B. Thayer,	Cambridge.

SECTION II. — 21.

Philology and Archæology.

William S. Appleton,	Boston.
Charles P. Bowditch,	Boston.
Lucien Carr,	Cambridge.
Franklin Carter,	Williamstown.
Joseph T. Clarke,	Boston.
Henry G. Denny,	Boston.
Epes S. Dixwell,	Cambridge.
William Everett,	Quincy.
William W. Goodwin,	Cambridge.
Henry W. Haynes,	Boston.
Charles R. Lanman,	Cambridge.
David G. Lyon,	Cambridge.
Bennett H. Nash,	Boston.
Frederick W. Putnam,	Cambridge.
Edward Robinson,	Boston.
F. B. Stephenson,	Boston.
Joseph H. Thayer,	Cambridge.
Crawford H. Toy,	Cambridge.
John W. White,	Cambridge.
John H. Wright,	Cambridge.
Edward J. Young,	Waltham.

SECTION III. — 13.

Political Economy and History.

Charles F. Adams,	Lincoln.
Edward Atkinson,	Boston.
Andrew M. Davis,	Cambridge.
Charles F. Dunbar,	Cambridge.
John Fiske,	Cambridge.
A. C. Goodell,	Salem.
Henry C. Lodge,	Nahant.
A. Lawrence Lowell,	Boston.
Augustus Lowell,	Boston.
James F. Rhodes,	Boston.
John C. Ropes,	Boston.
Denman W. Ross,	Cambridge.
Charles C. Smith,	Boston.

SECTION IV. — 12.

Literature and the Fine Arts.

Francis Bartlett,	Boston.
John Bartlett,	Cambridge.
George S. Boutwell,	Groton.
J. Elliot Cabot,	Brookline.
T. W. Higginson,	Cambridge.
George L. Kittredge,	Cambridge.
S. R. Koehler,	Boston.
Charles G. Loring,	Boston.
Percival Lowell,	Brookline.
Charles Eliot Norton,	Cambridge.
Horace E. Scudder,	Cambridge.
Barrett Wendell,	Boston.

ASSOCIATE FELLOWS. — 91.

(Number limited to one hundred. Elected as vacancies occur.)

Class I. — *Mathematical and Physical Sciences.* — 34.

Section I. — 14.

Mathematics and Astronomy.

Edward E. Barnard, Chicago.
S. W. Burnham, Chicago.
George Davidson, San Francisco.
Fabian Franklin, Baltimore.
Asaph Hall, Cambridge.
George W. Hill, Washington.
E. S. Holden, Washington.
James E. Keeler, Mt. Hamilton, Cal.
Emory McClintock, New York.
Simon Newcomb, Washington.
Charles L. Poor, Baltimore.
George M. Searle, Washington.
J. N. Stockwell, Cleveland, O.
Chas. A. Young, Princeton, N. J.

Section II. — 6.

Physics.

Carl Barus, Providence, R.I.
J. Willard Gibbs, New Haven.
S. P. Langley, Washington.
A. A. Michelson, Chicago.
Ogden N. Rood, New York.
H. A. Rowland, Baltimore.

Section III. — 7.

Chemistry.

Wolcott Gibbs, Newport, R.I.
Frank A. Gooch, New Haven.
S. W. Johnson, New Haven.
J. W. Mallet, Charlottesville, Va.
E. W. Morley, Cleveland, O.
J. M. Ordway, New Orleans.
Ira Remsen, Baltimore.

Section IV. — 7.

Technology and Engineering.

Henry L. Abbot, New York.
Cyrus B. Comstock, Washington.
W. P. Craighill, Washington.
F. R. Hutton, New York.
George S. Morison, Chicago.
William Sellers, Philadelphia.
Robt. S. Woodward, New York.

Class II. — *Natural and Physiological Sciences.* — 31.

Section I. — 15.

Geology, Mineralogy, and Physics of the Globe.

Cleveland Abbe, Washington.
George J. Brush, New Haven.
Edward S. Dana, New Haven.
Walter G. Davis, Cordova, Arg.
Sir J. W. Dawson, Montreal.
G. K. Gilbert, Washington.
Clarence King, New York.
Joseph LeConte, Berkeley, Cal.
J. Peter Lesley, Milton, Mass.
S. L. Penfield, New Haven.
J. W. Powell, Washington.
R. Pumpelly, Newport, R.I.
A. R. C. Selwyn, Ottawa.
G. C. Swallow, Columbia, Mo.
Charles D. Walcott, Washington.

SECTION II. — 4.

Botany.

D. H. Campbell,	Palo Alto, Cal.
J. M. Coulter,	Chicago.
W. Trelease,	St. Louis.
John D. Smith,	Baltimore.

SECTION III. — 5.

Zoölogy and Physiology.

Joel A. Allen,	New York.
W. K. Brooks,	Baltimore.
S. Weir Mitchell,	Philadelphia.
A. S. Packard,	Providence, R.I.
A. E. Verrill,	New Haven.

SECTION IV. — 7.

Medicine and Surgery.

John S. Billings,	New York.
Jacob M. Da Costa,	Philadelphia.
W. A. Hammond,	New York.
William Osler,	Baltimore.
Alfred Stillé,	Philadelphia.
Wm. H. Welch,	Baltimore.
H. C. Wood,	Philadelphia.

CLASS III. — *Moral and Political Sciences.* — 26.

SECTION I. — 5.

Philosophy and Jurisprudence.

James C. Carter,	New York.
D. R. Goodwin,	Philadelphia.
Charles S. Peirce,	New York.
T. R. Pynchon,	Hartford, Conn.
Jeremiah Smith,	Cambridge.

SECTION II. — 7.

Philology and Archæology.

A. N. Arnold,	Pawtuxet, R.I.
Timothy Dwight,	New Haven.
B. L. Gildersleeve,	Baltimore.
D. C. Gilman,	Baltimore.
T. R. Lounsbury,	New Haven.
E. E. Salisbury,	New Haven.
A. D. White,	Ithaca, N.Y.

SECTION III. — 6.

Political Economy and History.

Henry Adams,	Washington.
G. P. Fisher,	New Haven.
H. E. von Holst,	Chicago.
Henry C. Lea,	Philadelphia.
Edward J. Phelps,	Burlington, Vt.
W. G. Sumner,	New Haven.

SECTION IV. — 8.

Literature and the Fine Arts.

James B. Angell,	Ann Arbor, Mich.
L. P. di Cesnola,	New York.
F. E. Church,	New York.
H. H. Furness,	Philadelphia.
R. S. Greenough,	Florence.
Augustus St. Gaudens,	New York.
E. C. Stedman,	Bronxville, N.Y.
W. R. Ware,	New York.

FOREIGN HONORARY MEMBERS. — 67.

(Number limited to seventy-five. Elected as vacancies occur.)

Class I. — *Mathematical and Physical Sciences.* — 21.

Section I. — 7.

Mathematics and Astronomy.

Arthur Auwers,	Berlin.
George H. Darwin,	Cambridge.
H. A. E. A. Faye,	Paris.
Charles Hermite,	Paris.
William Huggins,	London.
Otto Struve,	Karlsruhe.
H. C. Vogel,	Potsdam.

Section II. — 5.

Physics.

Ludwig Boltzmann,	Vienna.
A. Cornu,	Paris.
Oliver Heaviside,	Newton Abbots.
Lord Rayleigh,	Witham.
Sir G. G. Stokes, Bart.,	Cambridge.

Section III. — 7.

Chemistry.

Adolf Baeyer,	Munich.
Marcellin Berthelot,	Paris.
Robert Bunsen,	Heidelberg.
J. H. van't Hoff,	Berlin.
D. Mendeleeff,	St. Petersburg.
Sir H. E. Roscoe,	London.
Julius Thomsen,	Copenhagen.

Section IV. — 2.

Technology and Engineering.

Lord Kelvin,	Glasgow.
Maurice Lévy,	Paris.

Class II. — *Natural and Physiological Sciences.* — 23.

Section I. — 5.

Geology, Mineralogy, and Physics of the Globe.

Albert Heim,	Zurich.
A. E. Nordenskiöld,	Stockholm.
C. F. Rammelsberg,	Berlin.
Henry C. Sorby,	Sheffield.
Heinrich Wild,	Zurich.

Section II. — 6.

Botany.

J. G. Agardh,	Lund.
E. Bornet,	Paris.
Sir Joseph D. Hooker,	Sunningdale.
W. Pfeffer,	Leipsic.
Solms-Laubach,	Strassburg.
Eduard Strasburger,	Bonn.

SECTION III. — 7.

Zoölogy and Physiology.

Michael Foster,	Cambridge.
Carl Gegenbauer,	Heidelberg.
Ludimar Hermann,	Königsberg.
Albrecht Kölliker,	Würzburg.
A. Kovalevsky,	St. Petersburg.
Lacaze-Duthiers,	Paris.
Elias Metschnikoff,	Paris.

SECTION IV. — 5.

Medicine and Surgery.

W. Kühne,	Heidelberg.
Lord Lister,	London.
Sir James Paget, Bart.,	London.
F. v. Recklinghausen,	Strassburg.
Rudolph Virchow,	Berlin.

CLASS III. — *Moral and Political Sciences.* — 23.

SECTION I. — 6.

Philosophy and Jurisprudence.

Heinrich Brunner,	Berlin.
F. W. Maitland,	Cambridge.
James Martineau,	London.
Sir Frederick Pollock,	Oxford.
Baron Russell of Killowen,	Tadworth.
Henry Sidgwick,	Cambridge.

SECTION II. — 7.

Philology and Archæology.

Ingram Bywater,	Oxford.
W. Dörpfeld,	Athens.
Sir John Evans,	Hemel Hempstead.
J. W. A. Kirchhoff,	Berlin.
G. C. C. Maspero,	Paris.
Max Müller,	Oxford.
Karl Weinhold,	Berlin.

SECTION III. — 5.

Political Economy and History.

Duc de Broglie,	Paris.
James Bryce,	Oxford.
Hermann Grimm,	Berlin.
Theodor Mommsen,	Berlin.
William Stubbs,	Oxford.

SECTION IV. — 5.

Literature and the Fine Arts.

Georg Brandes,	Copenhagen.
F. Brunetière,	Paris.
Jean Léon Gérôme,	Paris.
John Ruskin,	Coniston.
Leslie Stephen,	London.

STATUTES AND STANDING VOTES.

STATUTES.

Adopted May 30, 1854: *amended September* 8, 1857, *November* 12, 1862, *May* 24, 1864, *November* 9, 1870, *May* 27, 1873, *January* 26, 1876, *June* 16, 1886, *October* 8, 1890, *January* 11 *and May* 10, 1893, *April* 11, *May* 9, *and October* 10, 1894, *and March* 13, *April* 10, *and May* 8, 1895.

CHAPTER I.

Of Fellows and Foreign Honorary Members.

1. The Academy consists of *Fellows* and *Foreign Honorary Members.* They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, viz.: Class I. The Mathematical and Physical Sciences; — Class II. The Natural and Physiological Sciences; — Class III. The Moral and Political Sciences. Each Class is divided into four Sections, viz.: Class I., Section 1. Mathematics and Astronomy; — Section 2. Physics; — Section 3. Chemistry; — Section 4. Technology and Engineering. Class II., Section 1. Geology, Mineralogy, and Physics of the Globe; — Section 2. Botany; — Section 3. Zoölogy and Physiology; — Section 4. Medicine and Surgery. Class III., Section 1. Philosophy and Jurisprudence; — Section 2. Philology and Archæology; — Section 3. Political Economy and History; — Section 4. Literature and the Fine Arts.

2. Fellows, resident in the State of Massachusetts, only, may vote at the meetings of the Academy.* Each Resident Fellow shall pay an admission fee of ten dollars and such annual assessment, not exceeding ten dollars, as shall be voted by the Academy at each Annual Meeting.

* The number of Resident Fellows is limited by the Charter to 200.

3. Fellows residing out of the State of Massachusetts shall be known and distinguished as Associate Fellows. They shall not be liable to the payment of any fees or annual dues, but on removing within the State shall be admitted to the privileges,* and be subject to the obligations, of Resident Fellows. The number of Associate Fellows shall not exceed *one hundred*, of whom there shall not be more than *forty* in either of the three Classes of the Academy.

4. The number of Foreign Honorary Members shall not exceed *seventy-five;* and they shall be chosen from among persons most eminent in foreign countries for their discoveries and attainments in either of the three departments of knowledge above enumerated. And there shall not be more than *thirty* Foreign Members in either of these departments.

CHAPTER II.

Of Officers.

1. There shall be a President, three Vice-Presidents, one for each Class, a Corresponding Secretary, a Recording Secretary, a Treasurer, and a Librarian, which officers shall be annually elected, by ballot, at the Annual Meeting, on the second Wednesday in May.

2. At the same time, and in the same manner, nine Councillors shall be elected, three from each Class of the Academy, but the same Fellows shall not be eligible on more than three successive years. These nine Councillors, with the President, the three Vice-Presidents, the two Secretaries, the Treasurer, and the Librarian, shall constitute the Council. It shall be the duty of this Council to exercise a discreet supervision over all nominations and elections. With the consent of the Fellow interested, they shall have power to make transfers between the several Sections of the same Class, reporting their action to the Academy.

3. If any office shall become vacant during the year, the vacancy shall be filled by a new election, and at the next stated meeting, or at a meeting called for this purpose.

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* Associate Fellows may attend, but cannot vote, at meetings of the Academy. See Chapter I. 2.

CHAPTER III.

Of Nominations of Officers.

1. At the stated meeting in March, the President shall appoint from the next retiring Councillors a Nominating Committee of three Fellows, one for each class.

2. It shall be the duty of this Nominating Committee to prepare a list of candidates for the offices of President, Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, Librarian, Councillors, and the Standing Committees which are chosen by ballot; and to cause this list to be sent by mail to all the Resident Fellows of the Academy not later than four weeks before the Annual Meeting.

3. Independent nominations for any office, signed by at least nve Resident Fellows and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call for the Annual Meeting, which shall then be issued not later than one week before that meeting.

4. The Recording Secretary shall prepare for use, in voting at the Annual Meeting, a ballot containing the names of all persons nominated for office under the conditions given above.

5. When an office is to be filled at any other time than at the Annual Meeting, the President shall appoint a Nominating Committee, in accordance with the provisions of Section 1, which shall announce its nomination in the manner prescribed in Section 2 at least two weeks before the time of election. Independent nominations, signed by at least five Resident Fellows and received by the Recording Secretary not later than one week before the meeting for election, shall be inserted in the call for that meeting.

CHAPTER IV.

Of the President.

1. It shall be the duty of the President, and, in his absence, of the senior Vice-President present, or next officer in order as above enumerated, to preside at the meetings of the Academy; to summon extraordinary meetings, upon any urgent occasion; and to execute or see to the execution of the Statutes of the

Academy. Length of continuous membership in the Academy shall determine the seniority of the Vice-Presidents.

2. The President, or, in his absence, the next officer as above enumerated, is empowered to draw upon the Treasurer for such sums of money as the Academy shall direct. Bills presented on account of the Library, or the Publications of the Academy, must be previously approved by the respective committees on these departments.

3. The President, or, in his absence, the next officer as above enumerated, shall nominate members to serve on the different committees of the Academy which are not chosen by ballot.

4. Any deed or writing to which the common seal is to be affixed shall be signed and sealed by the President, when thereto authorized by the Academy.

CHAPTER V.

Of Standing Committees.

1. At the Annual Meeting there shall be chosen the following Standing Committees, to serve for the year ensuing, viz.: —

2. The Committee of Finance, to consist of the President, Treasurer, and one Fellow chosen by ballot, who shall have charge of the investment and management of the funds and trusts of the Academy. The general appropriations for the expenditures of the Academy shall be moved by this Committee at the Annual Meeting, and all special appropriations from the general and publication funds shall be referred to or proposed by this Committee.

3. The Rumford Committee, of seven Fellows, to be chosen by ballot, who shall consider and report on all applications and claims for the Rumford Premium, also on all appropriations from the income of the Rumford Fund, and generally see to the due and proper execution of this trust.

4. The C. M. Warren Committee, of seven Fellows, to be chosen by ballot, who shall consider and report on all applications for appropriations from the income of the C. M. Warren Fund, and generally see to the due and proper execution of this trust.

5. The Committee of Publication, of three Fellows, to whom all memoirs submitted to the Academy shall be referred, and to

whom the printing of memoirs accepted for publication shall be intrusted.

6. The Committee on the Library, of three Fellows, who shall examine the Library, and make an annual report on its condition and management.

7. An Auditing Committee, of two Fellows, for auditing the accounts of the Treasurer.

CHAPTER VI.

Of the Secretaries.

1. The Corresponding Secretary shall conduct the correspondence of the Academy, recording or making an entry of all letters written in its name, and preserving on file all letters which are received; and at each meeting he shall present the letters which have been addressed to the Academy since the last meeting. With the advice and consent of the President, he may effect exchanges with other scientific associations, and also distribute copies of the publications of the Academy among the Associate Fellows and Foreign Honorary Members, as shall be deemed expedient; making a report of his proceedings at the Annual Meeting. Under the direction of the Council for Nomination, he shall keep a list of the Fellows, Associate Fellows, and Foreign Honorary Members, arranged in their Classes and in Sections in respect to the special sciences in which they are severally proficient; and he shall act as secretary to the Council.

2. The Recording Secretary shall have charge of the Charter and Statute-book, journals, and all literary papers belonging to the Academy. He shall record the proceedings of the Academy at its meetings; and after each meeting is duly opened, he shall read the record of the preceding meeting. He shall notify the meetings of the Academy, and apprise committees of their appointment. He shall post up in the Hall a list of the persons nominated for election into the Academy; and when any individual is chosen, he shall insert in the record the names of the Fellows by whom he was nominated.

3. The two Secretaries, with the Chairman of the Committee of Publication, shall have authority to publish such of the proceedings of the Academy as as may seem to them calculated to promote the interests of science.

CHAPTER VII.

Of the Treasurer.

1. The Treasurer shall give such security for the trust reposed in him as the Academy shall require.

2. He shall receive officially all moneys due or payable, and all bequests or donations made to the Academy, and by order of the President or presiding officer shall pay such sums as the Academy may direct. He shall keep an account of all receipts and expenditures; shall submit his accounts to the Auditing Committee; and shall report the same at the expiration of his term of office.

3. The Treasurer shall keep a separate account of the income and appropriation of the Rumford Fund, and report the same annually.

4. All moneys which there shall not be present occasion to expend shall be invested by the Treasurer, under the direction of the Finance Committee, on such securities as the Academy shall direct.

CHAPTER VIII.

Of the Librarian and Library.

1. It shall be the duty of the Librarian to take charge of the books, to keep a correct catalogue of same, and to provide for the delivery of books from the Library. He shall also have the custody of the publications of the Academy.

2. The Librarian, in conjunction with the Committee on the Library, shall have authority to expend, as they may deem expedient, such sums as may be appropriated, either from the Rumford or the General Fund of the Academy, for the purchase of books, and for defraying other necessary expenses connected with the Library. They shall have authority to propose rules and regulations concerning the circulation, return, and safe-keeping of books; and to appoint such agents for these purposes as they may think necessary.

3. To all books in the Library procured from the income of the Rumford Fund, the Librarian shall cause a stamp or label to be affixed, expressing the fact that they were so procured.

4. Every person who takes a book from the Library shall give a receipt for the same to the Librarian or his assistant.

5. Every book shall be returned in good order, regard being had to the necessary wear of the book with good usage. And if any book shall be lost or injured, the person to whom it stands charged shall replace it by a new volume or set, if it belongs to a set, or pay the current price of the volume or set to the Librarian; and thereupon the remainder of the set, if the volume belonged to a set, shall be delivered to the person so paying for the same.

6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

CHAPTER IX.

Of Meetings.

1. There shall be annually four stated meetings of the Academy; namely, on the second Wednesday in May (the Annual Meeting), on the second Wednesday in October, on the second Wednesday in January, and on the second Wednesday in March. At these meetings only, or at meetings adjourned from these and regularly notified, shall appropriations of money be made, or alterations of the statutes or standing votes of the Academy be effected.

2. Fifteen Fellows shall constitute a quorum for the transaction of business at a stated meeting. Seven Fellows shall be sufficient to constitute a meeting for scientific communications and discussions.

3. The Recording Secretary shall notify the meetings of the Academy to each Fellow residing in Boston and the vicinity; and he may cause the meetings to be advertised, whenever he deems such further notice to be needful.

CHAPTER X.

Of the Election of Fellows and Honorary Members.

1. Elections shall be made by ballot, and only at stated meetings.

2. Candidates for election as Resident Fellows must be proposed by two or more Resident Fellows, in a recommendation signed by them, specifying the Section to which the nomination is made, which recommendation shall be transmitted to the Corresponding Secretary, and by him referred to the Council for Nomination. No person recommended shall be reported by the Council as a candidate for election, unless he shall have received a written approval, signed at a meeting of the Council by at least seven of its members. All nominations thus approved shall be read to the Academy at a stated meeting, and shall then stand on the nomination list during the interval between two stated meetings, and until the balloting. No person shall be elected a Resident Fellow, unless he shall have been resident in this Commonwealth one year next preceding his election. If any person elected a Resident Fellow shall neglect for one year to pay his admission fee, his election shall be void; and if any Resident Fellow shall neglect to pay his annual assessments for two years, provided that his attention shall have been called to this article, he shall be deemed to have abandoned his Fellowship; but it shall be in the power of the Treasurer, with the consent of the Council, to dispense (*sub silentio*) with the payment both of the admission fee and of the assessments, whenever in any special instance he shall think it advisable so to do.

3. The nomination of Associate Fellows shall take place in the manner prescribed in reference to Resident Fellows; and after such nomination shall have been publicly read at a stated meeting previous to that when the balloting takes place, it shall be referred to the Council for Nomination; and a written approval, authorized and signed at a meeting of said Council by at least seven of its members, shall be requisite to entitle the candidate to be balloted for. The Council may in like manner originate nominations of Associate Fellows, which must be read at a stated meeting previous to the election, and be exposed on the nomination list during the interval.

4. Foreign Honorary Members shall be chosen only after a nomination made at a meeting of the Council, signed at the time by at least seven of its members, and read at a stated meeting previous to that on which the balloting takes place.

5. Three fourths of the ballots cast must be affirmative, and the number of affirmative ballots must amount to eleven to effect an election of Fellows or Foreign Honorary Members.

6. Each Section of the Academy is empowered to present lists of persons deemed best qualified to fill vacancies occurring in the number of Foreign Honorary Members or Associate Fellows allotted to it; and such lists, after being read at a stated meeting, shall be referred to the Council for Nomination.

7. If, in the opinion of a majority of the entire Council, any Fellow — Resident or Associate — shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his Fellowship; and provided that a majority of two thirds of the Fellows at a stated meeting, consisting of not less than fifty Fellows, shall adopt this recommendation, his name shall be stricken off the roll of Fellows.

CHAPTER XI.

Of Amendments of the Statutes.

1. All proposed alterations of the Statutes, or additions to them, shall be referred to a committee, and, on their report at a subsequent meeting, shall require for enactment a majority of two thirds of the members present, and at least eighteen affirmative votes.

2. Standing Votes may be passed, amended, or rescinded, at any stated meeting, by a majority of two thirds of the members present. They may be suspended by a unanimous vote.

CHAPTER XII.

Of Literary Performances.

1. The Academy will not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its publications.

STANDING VOTES.

1. Communications of which notice had been given to the Secretary shall take precedence of those not so notified.

2. Resident Fellows who have paid all fees and dues chargeable to them are entitled to receive one copy of each volume or article printed by the Academy, on application to the Librarian personally or by written order, within two years from the date of publication. And the current issues of the Proceedings shall be supplied, when ready for publication, free of charge, to all the Fellows and members of the Academy who desire to receive them.

3. The Committee of Publication shall fix from time to time the price at which the publications of the Academy may be sold. But members may be supplied at half this price with volumes which they are not entitled to receive free, and which are needed to complete their sets.

4. Two hundred extra copies of each paper accepted for publication in the Memoirs or Proceedings of the Academy shall be placed at the disposal of the author, free of charge.

5. Resident Fellows may borrow and have out from the Library six volumes at any one time, and may retain the same for three months, and no longer.

6. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

7. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy, except by special leave of the Librarian.

8. Books, publications, or apparatus shall be procured from the income of the Rumford Fund only on the certificate of the Rumford Committee that they, in their opinion, will best facilitate and encourage the making of discoveries and improvements which may merit the Rumford Premium.

9. The Annual Meeting and the other stated meetings shall be holden at eight o'clock, P. M.

10. A meeting for receiving and discussing scientific communications may be held on the second Wednesday of each month not appointed for stated meetings, excepting July, August, and September.

RUMFORD PREMIUM.

In conformity with the terms of the gift of Benjamin, Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of said fund, as it now exists, at any Annual Meeting, an award of a gold and silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind; and to add to such medals, as a further premium for such discovery and improvement, if the Academy see fit so to do, a sum of money not exceeding three hundred dollars.

INDEX.

Acanthocarpha, 512.
Acerates Pringlei, 570.
Achorutes communis, 263.
  gracilis, 263.
Agassiz, A., On the Relationship of the Oceanic Currents and the Pelagic Fauna, 632.
Agave (Littæa) intrepida, 567.
Alatipes, 538.
Amphiboles and Pyroxenes, 309, 371.
Aphorura inermis, 262.
Atomic Weight of Cobalt, 349; of Nickel, 325.
Atomic Weights, Table of, 637.
Ayres, C. H. *See* Hall, E. H., and Ayres, C. H.

Baccharis macrocephala, 575.
Bahia xylopoda, 577.
Bibliography of Shoreline Topography, 247.
Bidens decumbens, 576.
Biographical Notices, List of, 639.
  Samuel Eliot, 646.
  Theodore Lyman, 656.
  Jules Marcou, 651.
  Justin Winsor, 641.
Bromide, Cobaltous, 349; Nickelous, 325.

Cacalia ampullacea, 577.
Cadmium and Zinc Amalgams, 85.
Cast Iron, Thermal Conductivity of, 281.
Cestrum flavescens, 572.
Chemical Laboratory of Harvard College, Contributions from, 57, 85, 101, 117, 137, 275, 325, 349.
Churchill, J. B. *See* Jackson, C. L., and Churchill, J. B.
Clayton, H. H., Investigations on Periodicity in the Weather, 597–618.
Cobalt, Atomic Weight of, 349.
Collembola, Japanese, 259.
Committee of Publication, Report of, 627.
Composition of Natural Gas, 69.
Contact-potential between Metals and Fused Salts, 57.
Correspondence, 630, 632, 633, 635, 636.
Council, Report of, 639.
Cremastocephalus affinis, 265.
Croton Ehrenbergii, 568.
Cushman, A. S. *See* Richards, T. W., and Cushman, A. S.

Daly, R. A., A Comparative Study of Etch-figures. The Amphiboles and Pyroxenes, 371–429.
  On a new Variety of Hornblende, 431–437.
  On the Optical Characters of the Vertical Zone of Amphiboles and Pyroxenes; and on a new Method of determining the Extinction Angles of these Minerals by means of Cleavage Pieces, 309–323.
Desmanthodium lanceolatum, 576.
Dissociation of Fused Salts, 57.

Eakle, A. S., Petrographical Notes on some Rocks from the Fiji Islands, 579–595.
Electrochemical Relations of Zinc and Cadmium Amalgams, 85.
Eleocharis acicullariformis, 566.
  diandra, 496.
  Engelmanni, 495.
  lanceolata, 493.
  Macounii, 497.
  monticola, 496.
  obtusa, 492.
  ovata, 485, 494.
Entomobrya straminea, 265.
Eriocarpha, 509.

Etch-figures on Amphiboles, 371.
Eupatorium Conzattii, 574.
leptodictyon, 574.
Euphorbia dictyosperma, 568.

Fellows, Associate, Deceased, —
Thomas McIntyre Cooley, 630.
James Hall, 630.
Othniel Charles Marsh, 638.
David Ames Wells, 632.
Fellow, Associate, elected, —
Charles Doolittle Walcott, 634.
Fellows, Associate, List of, 669.
Fellows, Resident, deceased, —
John Cummings, 634.
Samuel Eliot, 630.
Fellows, Resident, elected, —
George Lyman Kittredge, 630.
Francis Cabot Lowell, 630.
Arthur Amos Noyes, 634.
James Ford Rhodes, 631.
Henry Paul Talbot, 634.
Oliver Fairfield Wadsworth, 634.
Robert DeCourcy Ward, 629.
Fellows, Resident, List of, 665.
Fellows, Resident, withdrawn, —
Mellen Chamberlain, 634.
Charles James Sprague, 634.
Warren Upham, 634.
Ferdinanda, 531.
Fernald, M. L., Contributions from the Gray Herbarium of Harvard University, New Series, No. 15, 483–503.
Fiji Islands, Rocks from, 579.
Fiske, John, On Eccentric Literature, 634.
Folsom, J. W., Japanese Collembola, 259–274.
Foreign Honorary Members, deceased, —
Pierre Cécile Puvis de Chavannes, 632.
William Ewart Gladstone, 630.
Foreign Honorary Members, elected, —
George Howard Darwin, 630.
Oliver Heaviside, 634.
Foreign Honorary Members, List of, 671.

Gazzolo, F. H. *See* Jackson, C. L., and Gazzolo, F. H.
Geographic Cycle, 154.
Gonolobus (Chthalamia) bifidus, 570.
Gordon, C. McC., The Contact-potential between Metals and Fused Salts, and the Dissociation of Fused Salts, 57–68.
Gray Herbarium of Harvard University, Contributions from, 483, 505.
Greenman, J. M. *See* Robinson, B. L., and Greenman, J. M.
Grindelia glandulosa, 575.
Gulliver, F. P., Shoreline Topography, 149–258.

Hall, E. H., and Ayres, C. H., On the Thermal Conductivity of Cast Iron, 281–308.
Hamulium, 537.
Hardystonite, 477.
Harvard Mineralogical Museum, Contributions from, 371, 431, 447, 579.
Heat Conduction in Iron, 281.
Hornblende, 431.
Hybridella, 530.

Ipomœa nymphæifolia, 570.
Isotoma nitida, 264.

Jackson, C. L., and Gazzolo, F. H., On certain Derivatives of Symmetrical Trichlorbenzol, 137–148.
Jackson, C. L., and Koch, W., On the Action of Sodic Ethylate on Tribromdinitrobenzol, 117–135.
Jackson, C. L., and Phinney, J. I., Trinitrophenylmalonic Ester, 101–116.
Japanese Collembola, 259.

Keeler, James E., Award of Rumford Premium to, 626, 628.
Koch, W. *See* Jackson, C. L., and Koch, W.

Lactuca brachyrhyncha, 578.
Lepachys columnaris, 576.
Lewis, G. N. *See* Richards, T. W., and Lewis, G. N.
Librarian, Report of, 622.
Lipactinia, 563.

Macromeria Pringlei, 570.
Marble, Thermal Conductivity of, 47.

Mendenhall, T. C., On Allen's Application of the Indicator Diagram to Rowing, 632; Progress in the Use of a Ring Pendulum for Gravity Determinations, 632.
Menodora helianthemoides, 569.
Mexican Phanerogams, 566.
Montagnæa ensifolia, 521.
heterophylla, 521.
Montanoa, Revision of, 507.
anomala, 509.
arborescens, 515.
Aschenbornii, 520.
atriplicifolia, 520.
bipinnatifida, 519.
clematidea, 520.
crenata, 520.
dumicola, 518.
elegans, 520.
floribunda, 509.
frutescens, 514.
gracilis, 518.
grandiflora, 518.
guatemalensis, 514.
heracleifolia, 520.
heterophylla, 520.
hexagona, 514.
hibiscifolia, 513.
Karwinskii, 520.
macrolepis, 512.
microcephala, 510.
myriocephala, 511.
Olivæ, 521.
Orbignyana, 521.
ovalifolia, 515.
Palmeri, 511.
patens, 516.
pauciflora, 517.
Pittieri, 517.
Pringlei, 512.
purpurascens, 515.
purpurea, 521.
pyramidata, 519.
quadrangularis, 513.
Rosei, 512.
samalensis, 513.
Schottii, 518.
Seleriana, 510.
speciosa, 519.
subtruncata, 516.
Thomasii, 521.
tomentosa, 510.
triloba, 521.
uncinata, 516.
xanthiifolia, 511.
Natural Gas, Composition of, 69.
Nickel, Atomic Weight of, 325.
Nominating Committee, 635.

Ochractinia, 559.
Officers elected, 628.

Papirius denticulatus, 268.
Peirce, B. O., and Willson, R. W., On the Thermal Conductivities of certain Poor Conductors, 1–56.
Periodicity in the Weather, 597.
Perymenium, Revision of, 507, 521.
album, 529.
asperifolium, 525.
Barclayanum, 522.
Berlandieri, 528.
buphthalmoides, 523.
Cervantesii, 523.
chalarolepis, 525.
croceum, 527.
discolor, 527.
Ghiesbreghtii, 525.
gracile, 526.
grande, 529.
gymnolomoides, 526.
jaliscense, 524.
Klattii, 528.
Mendezii, 528.
microcephalum, 525.
microphyllum, 527.
Nelsonii, 529.
parvifolium, 524.
pellitum, 527.
Pringlei, 526.
Rosei, 523.
rude, 526.
subsquarrosum, 524.
tenellum, 522.
verbesinoides, 524.
Phaseolus microcarpus, 568.
Philipstadite, 437.
Phillips, F. C., On Fluctuations in the Composition of Natural Gas, 69–83.
Phinney, J. I. *See* Jackson, C. L., and Phinney, J. 7.
Picrylmalonic Ester, 101.
Pithecoctenium buccinatorium, 572.
Platypteris, 537.
Proceedings of Meetings, 621.
Pseudomontanoa, 558.
Pterophyton, 539.
Pyroxenes, 309, 371.

Randia canescens, 573.
Nelsonii, 574.
Richards, T. W., A Table of Atomic Weights, 637.
Richards, T. W., and Baxter, G. P. A Revision of the Atomic Weight of Cobalt, 349–369.
Richards, T. W., and Churchill, J. B., The Use of the Transition Temperatures of Complex Systems as Fixed Points in Thermometry, 275–280.
Richards, T. W., and Cushman, A. S., A Revision of the Atomic Weight of Nickel, 325–348.
Richards, T. W., and Lewis, G. N., Some Electrochemical and Thermochemical Relations of Zinc and Cadmium Amalgams, 85–99.
Robinson, B. L., and Greenman, J. M., Contributions from the Gray Herbarium of Harvard University, New Series, No. 16, 505–578.
Ruellia malacosperma, 572.
Rumford Committee, Report of, 623.
Rumford Fund, Papers published by Aid of, 1, 281.
Rumford Premium, Award of, 626, 628.

Sabbatia arenicola, 569.
Saubinetia, 549.
Schistocerca, 439; Table of the Species, 442.
æqualis, 458.
albolineata, 466.
alutacea, 464.
americana, 474.
aurantia, 448.
australis, 459.
bivittata, 471.
bogotensis, 460.
camerata, 451.
cancellata, 473.
carinata, 449.
columbina, 449.
crocotaria, 450.
damnifica, 475.
desiliens, 455.
exsul, 473.
flavofasciata, 456.
gracilis, 447.
gulosa, 459.
idonea, 461.
Schistocerca infumata, 457.
inscripta, 461.
interrita, 450.
lineata, 465.
literosa, 462.
maya, 458.
melanocera, 462.
mellea, 452.
mexicana, 468.
obliquata, 470.
obscura, 465.
pallens, 473.
paranensis, 472.
peregrina, 472.
perturbans, 471.
pyramidata, 454.
rubiginosa, 462.
separata, 469.
shoshone, 469.
simulatrix, 454.
sonorensis, 463.
vaga, 454.
venusta, 467.
zapoteca, 453.
Scirpus atrocinctus, 502.
Eriophorum, 498, 500.
Scudder, S. H., The Orthopteran Genus Schistocerca, 439–476.
Seira japonica, 267.
Shoreline Topography, 149.
Sisymbrium Coulteri, 568.
Smilax Pringlei, 567.
Sminthurus hortensis, 269.
viridis, 270.
Sodic Ethylate, Action of, on Tribromdinitrobenzol, 117.
Solanum jaliscanum, 571.
jasminifolium, 571.
Sonoricola, 542.
Statutes and Standing Votes, 673.
Stenocarpha, 538.
Story, W. E., On some Mathematical Curiosities, 634.
Styrax Ramirezii, 568.

Thermal Conductivities of Poor Conductors, 1.
Thermal Conductivity of Cast Iron, 281.
Thermochemical Relations of Zinc and Cadmium Amalgams, 85.
Tomocerus varius, 267.
Topography, Shoreline, 149.
Transition Temperatures, 275.
Treasurer, Report of, 621.

Tribromdinitrobenzol, 117.
Trichlorbenzol, Derivatives of, 137.
Trinitrophenylmalonic Ester, 101.
Trowbridge, John, On High Tension Electricity, 632.

Uhdea, 518.

Verbesina, Synopsis of, 534.
abscondita, 557.
acapulcensis, 551.
acuminata, 561.
æstuans, 564.
alata, 537.
alternifolia, 565.
ancistrophora, 565.
arborea, 563.
argentea, 564.
Arnottii, 546.
aspilioides, 546.
auriculata, 563.
australis, 544.
bipinnatifida, 563.
boliviana, 549.
Bridgesii, 565.
Capitaneja, 540.
caracasana, 559.
chiapensis, 554.
chihuahuensis, 543
cinerascens, 553.
cinerea, 554.
Clausseni, 564.
coahuilensis, 546.
conyzoides, 564.
Coulteri, 540.
crassipes, 555.
crocata, 537.
cymosa, 565.
decurrens, 564.
dentata, 556.
dissita, 542.
diversifolia, 562.
Donnell-Smithii, 555.
elegans, 547.
encelioides, 544.
erosa, 542.
fastigiata, 558.
floribunda, 563.
Fraseri, 537.
gigantea, 561.
glabrata, 547.
Grayi, 553.
Grisebachii, 563.
guatemalensis, 550.
guianensis, 563.

Verbesina hastata, 565.
helianthoides, 549.
heterophylla, 540.
Hookeri, 565.
Humboldtii, 564.
hypargyrea, 556.
hypoglauca, 548.
hypoleuca, 546.
hypomalaca, 545.
ilicifolia, 564.
involucrata, 564.
Klattii, 538.
lanata, 558.
leprosa, 557.
leptochæta, 542.
Liebmannii, 548.
Lindheimeri, 541.
linifolia, 565.
longifolia, 545.
longipes, 541.
Mameana, 564.
Mandonii, 547.
megapotamica, 565.
microptera, 560.
molinaria, 553.
mollis, 552.
montanoifolia, 559.
nana, 543.
Nelsonii, 549.
neriifolia, 548.
nicotianæfolia, 563.
nudicaulis, 542.
oaxacana, 548, 565.
occidentalis, 549.
Oerstediana, 558.
olivacea, 557.
oncophora, 552.
oreopola, 550.
ovata, 565.
ovatifolia, 537.
pallens, 550.
Palmeri, 542.
paniculata, 566.
pauciflora, 563.
persicifolia, 556, 566.
perymenioides, 557.
pinnata, 562.
pinnatifida, 558, 566.
platyptera, 538.
podocephala, 566.
populifolia, 565.
potosina, 549.
prostrata, 565.
pterocaula, 539.
punctata, 561.

Verbesina resinosa, 553.
Robinsonii, 554.
Rosei, 539.
Rothrockii, 541.
rumicifolia, 560.
Sartorii, 566.
Saubinetia, 551.
scabra, 538.
scandens, 565, 566.
scaposa, 565.
Schaffneri, 540.
Schomburgkii, 564.
Seemannii, 557.
serrata, 552.
Soratæ, 551.
sordescens, 554.
sororia, 548.
sphærocephala, 538.
stenophylla, 546.
stricta, 545.
subcordata, 547.
sublobata, 562.
tetraptera, 539.
tomentosa, 566.
tridentata, 566.
trilobata, 559.
triplinervia, 565.
triradiata, 565.
turbacensis, 562.
tuberosa, 566.
venosa, 543.
viguieroides, 547.
virgata, 552.
virginica, 560.
Warei, 542.
Verbesina Wrightii, 537.
xanthochlora, 551.
Verbesinaria, 545.

Warren (C. M.) Committee, Report of, 627.
Warren (C. M.) Fund, Aid from, 69.
Webster, A. G., Maxwell's Dynamic Top, 631.
Willson, R. W. *See* Peirce, B. O., and Willson, R. W.
Wolff, J. E., A new Manganese Pyroxene from Franklin Furnace, 636; On Hardystonite, a new Calcium Zinc Silicate from Franklin Furnace, New Jersey, 477–481; The Structure and Origin of Agates, 636.

Ximenesia, 543.

Zaluzania, Revision of, 507, 530.
anthemidifolia, 531.
asperrima, 532.
augusta, 532.
Coulteri, 533.
discoidea, 534.
globosa, 530.
Grayana, 531.
megacephala, 533.
mollissima, 532.
myriophylla, 530.
resinosa, 533.
triloba, 531.
Zinc and Cadmium Amalgams, 85.

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